The Engineering and Mining Journal

VOL. LXXXVII. NEW YORK, MAY 22, 1909. NO. 21.

The Diamond Bearing Highlands of Bahia—II

Miscellaneous Mineral Resources of the Diamond Country Are Extensive but Have Received Only Slight Development. Mining Laws Favorable

BY J. C. BRANNER*

There is much manganese in the Minas series of the Chapada Diamantina. It was found to follow the strike of the rocks along the east face of the Serra de Jacobina, always in about the same stratigraphic position. The presence of the mineral is shown by the lumps of ore (psilomelane) scattered over the surface of the ground. At one place, just west of the city of Villa Nova and on the base of the eastern slope of the Jacobina range, the deposits have been prospected somewhat but no attempt has been made to mine or ship the ore. Near the same horizon this manganese is exposed again near the east base of the Serra de Sant 'Anna on Fazenda Amarante.

One might suppose that the long railway haul from the interior to tide water at Bahia, and the change of gage at Alagoinhas would be an insurmountable obstacle to the mining of manganese in this part of the state. It should be remembered, however, that the haul by rail from the interior of Minas Geraes to Rio de Janeiro is still longer and yet the Minas mines are among the best paying manganese deposits in the world. The railway haul from the Morro de Mina deposits in Minas is 468 km., and the haul from the mines at Miguel Burnier is 498 km. Villa Nova, near which the Bahia deposits occur, is 444 km. from the port of Bahia, and the railway haul could be shortened considerably by building a piece of railway from Entrocamento on the São Francisco line to reach the tide water at Santo Amaro or Cachoeira.

No reference is here made to the manganese deposits in the region near Nazareth in the State of Bahia. Those deposits are near the coast, are well known, and the mines have already been in operation several years. I have briefly described them in a paper[1] entitled, "The Manganese Deposits of Bahia and Minas, Brazil."

COPPER

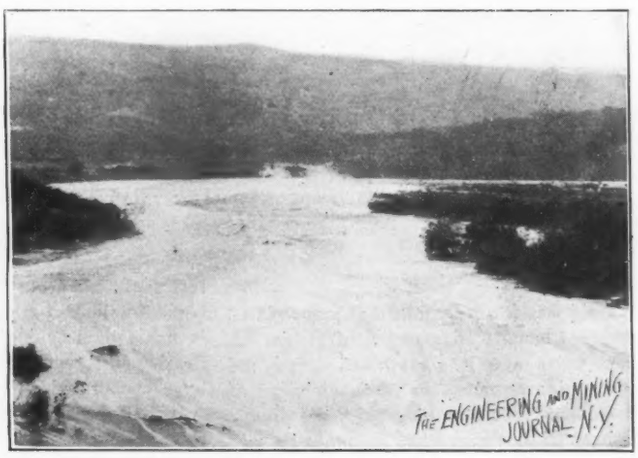
Copper is found on an estate called Carnahyba, about 40 km. west of Angico, a station on the São Francisco railway. This property was examined by an English company and an unsuccessful effort is said to have been made to purchase it. The writer did not personally visit the place, but sent an assistant, Roderic Crandall, through the region for the purpose of getting an idea of the general geology. Mr. Crandall made no detailed examination of the property but reported that the copper ore impregnated a basic eruptive that was deeply decomposed.

The rocks in which the ore occurs is an eruptive that varies from a pyroxenite to a norite or hypersthene gabbro, and belongs to the pre-Cambrian crystalline series mentioned above. No attempt was made to obtain an average sample of the ore but a specimen, taken pretty much at random and probably rather above the average, was assayed and found to contain 3.83 per cent. of metallic copper. In all the specimens seen the ore is in the form of malachite and chrysocolla which form a multitude of small veins through the altered rock.

The copper-bearing eruptives are found at several other places within the area of crystalline rocks east and northeast of Angico as far as Patamuté. Some specimens of copper ore given me in 1907 and said to have come from the Serra de Muribeca, 80 km. south of Capim Grosso, have the copper in the form of malachite

THE VALLEY AT MOSQUITOS

Seven kilometers south of Lencoes; the serra of the diamond-bearing rocks in the background; the valley in the foreground is deeply filled with the waste from old diamond washings.



JUNCTION OF THE ANDARAHY AND PARAGUASSU RIVERS

Low grounds, three kilometers southeast of Andarahy. Taken at time of high water. The diamond-bearing serra in the background.

Farther north the ore is found along the east base of the same range two or three kilometers west of the village of Jaguarary. It occurs again on the east slope of the range a few kilometers west of the station Itumerim. In the vicinity of the city of Jacobina the manganese appears on the east side of the range in about the same stratigraphic position. It was found in the usual form of loose lumps of ore in the red soil, about one kilometer east of the Engenho de João Dias on the *sitio* Cruz das Almas. The same kind of ore is reported from several other points along the east face of the Jacobina range.

*Professor of geology, Stanford University, California.

[1] *Transactions* of the American Institute of Mining Engineers, Vol. XXIX, pp. 756-770, New York, September, 1899.

and cuprite. An assay of this ore shows it to contain 39.1 per cent. of metallic copper. The specimen is apparently a picked one.

If these copper deposits are found to be of sufficient magnitude and richness to be workable, a branch railway can readily be constructed from Angico to the mines, owing to the flatness of the country. The scarcity of fuel and water would make it difficult to reduce the ore on the ground. Occasional specimens of copper have been reported from several other portions of the state of Bahia, but so far as the writer has been able to learn the region above referred to is the only one that holds out much promise of becoming productive.

The facts here given can only be regarded as suggestions which may be worth following up. A sentence from a recent publication[2] on the minerals of the state of Bahia expresses the popular idea of the importance of the Carnahyba deposits: "The Carnahyba mine alone could furnish copper enough to supply the whole world for 100 years!"

work certain hydraulic properties at Caldeirão, where placer gold has been mined, but after spending much money the company is reported to have abandoned its projects. Considerable gold was formerly taken out in the vicinity of Rio de Contas, but the industry is said to have been abandoned many years ago. That particular region was not visited by the writer, and nothing authoritative can be said of it here.

Salt Production in the Interior

In every list one can find of the mineral products of Bahia rock salt is always mentioned. Whether rock salt really exists in Bahia cannot be stated positively, but the writer has never been able to find it, though diligent search has been made and many clews have been followed up. Search has also been made for salt-water springs but thus far without success. It now seems probable that the expression "rock salt" has been used without a clear idea of its meaning. Large quantities of salt are annually manufactured in the interior of Bahia, but in every case that has come to the writer's knowledge, this salt is made by leaching the upper layers of the dry earth where lakes, ponds and pools have evaporated.

It will be noted that a large part of this region is covered with limestones.

Throughout this limestone area most of the country is flat and the streams, when they exist, are sluggish. The result is that in seasons of rain the water gathers in shallow ponds that soon dry up. This process of concentration carried on for long periods has left the salt and other easily soluble minerals from these waters in the soft, limy earth in the bottoms of the ponds. After the water evaporates the people gather up the thin upper layer of this earth, leach out the salt and boil the water down in iron kettles or allow it to evaporate in wooden troughs. In this way almost all of the salt supply of the interior is obtained. Of late years the prolongation of the railways has made it possible to ship better grades of salt into the interior, but those who live far from the railway lines still manufacture their own salt or buy it near at hand. In 1907 the railway freight on a sack of salt from Bahia to Joazeiro, a distance of 574 km., was from 66 to 82c. American money.

Although much has been written about salt in the interior, hitherto no one seems to have taken the trouble to have the salt examined chemically. It is common experience of persons traveling in the interior to be troubled with temporary and sometimes serious intestinal derangements that are attributed to the salt. Analyses do not seem to bear out this theory. Specimens of the salt made in the interior were brought away and analyzed, the results being shown in the accompanying table.

The sand in this salt could readily be eliminated; otherwise the analyses show the Salitre valley salt to be quite as good as the sea salt from Turks island or Lisbon.

CHARACTERISTIC VIEW ACROSS SALITRE VALLEY

It is covered with catinga forests. An abundance of excellent water can be had from wells in this region.

SURFACE LIME ROCK ALONG THE RAILWAY NORTH OF ANGICO

Gold

Gold was formerly mined at many places in the Chapada Diamantina of Bahia. A few years ago it was mined along the mountain streams in the vicinity of Jacobina. The stream gravels are so far exhausted, however, that it cannot be said that there is any systematic gold mining now carried on in these gravels. In the vicinity of Jacobina are some properties said to contain gold associated with various forms of pyrites, but at the time of the writer's visit to that part of the state none of these properties were being operated. Some gold is commonly found in washing for diamonds and carbonados, but there is not enough of it to constitute a gold-mining industry.

Gold is known to exist in the southern part of the Serra do Assuruá, and there has been some gold mining done in the vicinity of the village of Gentio. The gold is chiefly from stream gravels, but gold-bearing quartz is said to occur in the shales thereabout. A few years ago a gold-mining company was organized to

[2]Antonio J. de Souza Carneiro, *Riquezas Mineraes do Estado da Bahia;* p. 47. Bahia, 1908.

ANALYSES OF SALT FROM SALITRE VALLEY, BAHIA.

L. R. Lenox, Analyst.

	Tabua.	Varzea do Sal.
	Per Cent.	Per Cent.
Moisture and organic matter.	0.50	1.60
Insoluble matter, mostly sand	1.32	0.63
Magnesium sulphate ($MgSO_4$)	0.36	0.86
Calcium sulphate ($CaSO_4$)	2.68	1.78
Calcium chloride (CaCl)		0.63
Sodium chloride (NaCl)	95.20	94.68
Total	100.06	100.18

Saltpeter

One hears many reports of the existence of large quantities of saltpeter in this region. The Salitre (saltpeter) valley covers an area of 12,500 sq.km., and it is supposed that Rio Salitre took its name from the abundance of saltpeter within its drainage basin. There are large areas of limestone in that valley, and caves are common in the limestones, and these caves contain more or less saltpeter. However, I have never found any large quantities of saltpeter in the many caves I visited though the earth in the caves is generally more or less impregnated with it. In the regions of the Caboclo shales there are also a good many caverns which contain saltpeter. Such caves are common in the mountains lying about the eastern end of the Calmon valley, and about the Almas valley.

The saltpeter seems to have been formed in many instances by the reactions produced by the potash minerals and the droppings of small rodents, called *mocoto,* that live in the caves. In some cases it seems to have been washed in from the surface.

It is quite probable that an important saltpeter industry might be established by leaching the earth from the dry caves of the interior. The dryness of the atmosphere of the region would do away with the necessity and expense of artificial evaporation. Though the local demand is too small to warrant such an industry, foreign markets would readily be found for the output.

Mineral Pigments

In the Caboclo shales there are at many places ochers that will probably be valuable when transportation facilities will have improved. Such ochers appear to be abundant in the region about the Almas valley and east of the Calmon valley. On the road leading from Morro do Chapeo to Lençoes on an estate known as Roça Grande the yellow ocher beds are also well exposed at many places. A sample gathered about 2 km. south of the house at Roça Grande was analyzed by L. R. Lenox with the following results: Hygroscopic water, 0.73 per cent.; loss on ignition (water and organic matter), 7.14; sodium chloride (NaCl), 2.15; potassium oxide (K_2O), 1.32; sodium oxide (Na_2O), 0.13; oxide of iron (Fe_2O_3), 10.47; alumina (Al_2O_3), 20.71; silica (SiO_2), 56.54; lime (CaO), none; magnesia (MgO), 0.64; total, 99.83.

In the vicinity of Lençoes the diamond washers find some deep red rock fragments associated with the diamond-bearing gravels. These fragments, called *caco de telha* or tile fragments, are regarded as good "signs" of diamonds. They are simply lumps of impure iron ore that form beds of great thickness and wide distribution in certain parts of the diamond district. Their brilliant red color suggests the possibility of their being used for the manufacture of red paint. The following analysis shows the composition of some of the larger lumps: Hygroscopic moisture, 0.65 per cent.; loss on ignition (water and organic), 9.80; silica (SiO_2), 24.54; oxide of iron (Fe_2O_3), 50.84 (equivalent metallic iron, 35.57); alumina (Al_2O_3), 14.03; lime (CaO), none; magnesia (MgO), 0.21; total, 100.07.

Marble

Much of the rock shown on the accompanying map as limestone is marble. The beds are often so folded and the rocks so thinly bedded that they have no value as a marble. In other cases, however, the beds are thick enough to form good building stones, and the beds are horizontal or in position to be readily quarried. The colors vary from a straw color to a vermilion red and to a bluish black. There are also brecciated marbles of great beauty, while the travertine or "onyx" marbles are abundant and remarkably fine. At present no use is made of the marbles of this region.

At one place white saccharoidal marble was found among the rocks of the old crystalline series. This locality is on the line of the São Francisco railway at and about km. 435, or 4 km. north of the Carnahyba station.

Limestone Other Than Marble

There is a large demand for lime in Brazil and with the exception of accumulations of shells and the coral reefs along certain parts of the coast, there is but little limestone in that country within reach of water transportation. The railway from Bahia to Joazeiro on the Rio São Francisco crosses a zone north of Angico in which limestone covers the surface of the ground over an enormous area.

SALT FACTORY AT TABUA ON THE UPPER RIO SALITRE

The earth is scraped up in the foreground; the leaching troughs are under the trees near the heaps of the leached earth.

It was formerly supposed that this limestone was paleozoic and that the quantity of it was, for all practical purposes, unlimited. Years ago Mr. Derby expressed the opinion that the limestones in this particular belt were of fresh-water origin, and a careful examination of the entire section from Angico to Joazeiro shows that Mr. Derby's conclusion is practically correct. With the single exception of certain marbles mentioned above, the beds are all superficial and are spread over a wide flat plain to a depth which was nowhere found to exceed 10 meters.

On the line of the railway the limestone extends from km. 391 just north of Angico to km. 433, a short distance north of Carnahyba station. At several places, however, the drainage has removed it, and the underlying crystalline rocks are exposed. At and about Carnahyba the rock has been quarried for building purposes, and some of the stations of the railway are made of this limestone. It is also extensively burned for lime for which much of it is well adapted.

Although this limerock is of considerable local importance, owing to its convenience to railway transportation, there is not enough of it to meet any large demand or to maintain a constant output.

The great limestone areas of the state are in the valleys of the Salitre, Jacaré, and Rio Verde, and in a north-south belt lying along Riacho Utinga and Rio Una. The total area covered by limestones (and marbles) in these basins, and not including the great limestone regions lying north and west of the Rio São Francisco, amounts to about 25,000 sq. km. This estimate does not include the areas of recent land and fresh-water deposits such as those along the railway between Angico and Carnahyba.

The day will come, sooner or later, when some of these limestones will be used for the manufacture of portland cement. At present no portland cement is manufactured in Brazil. The cement used in that country is imported from Europe.

Close to the limestones there is an abundance of clays and clay shales, especially in the Caboclo beds, that would answer perfectly for the manufacture of portland cement.

Mica and Other Minerals

In the area of the old crystalline rocks many occurrences of mica of commercial importance are known. None of them, however, is worked at the present time. On the road between Jacobina and Villa Nova, I found a pegmatite dike containing beautiful crystals of mica, many of them measuring 10 cm. and some of them 15 cm. in diameter. Other similar dikes with equally large crystals are reported from many places in the valley of Rio Itapicurú. I have seen some fine mica plates said to have come from the vicinity of the falls

of Paulo Affonso. Many other localities are said to contain mica of commercial sizes. Mica mining would certainly be undertaken in this region if someone acquainted with the methods of mining, separating and marketing it would start the work and give the people a little practical experience of how it should be done.

Many other minerals occur in this region, but though they will doubtless be of great importance at some time in the future, they are of but little actual value under existing economic conditions. Among such minerals may be mentioned iron ore, iron pyrites, abrasives, refractory materials, building stones, slates, clays, glass sands, etc.

The Water Supply

In a region affected by droughts that sometimes draw themselves out for several years, the water supply is a matter of prime importance. Although the map shows many rivers traversing the diamond district of Bahia, as a matter of fact during the greater part of the year most of the streams shown on the map are stream channels rather than streams. The rural population lives chiefly by cattle raising and by farming on a small scale. In times of droughts nearly all of the smaller streams dry up, and to get water for domestic use and to water the cattle, rude, open pits are dug in favorable spots in the stream beds. When the droughts are prolonged beyond a certain period water for domestic use has to be brought for many leagues, and the cattle must be driven away or left to perish of thirst.

A study of the structural geology shows that water is really abundant throughout almost all the diamond district and can be had by means of ordinary open wells, by driven wells and even by bored artesian wells. The gently folded geological structure and the character of the rocks lend themselves readily to the use of artesian wells over a large part of the area. In the Salitre valley there is a series of gravels and sands usually lapping back against the bases of the mountains, especially along the western side of the valley. Water flowing from the mountain ranges sinks into this formation as soon as it reaches its margins and passes out toward the axis of the valley. It is very evident that these gravels contain an abundance of excellent water that can be reached almost anywhere in the gravel area.

Unfortunately the people living in this region know nothing about wells of any kind, and being very conservative, they are not disposed to try new methods of obtaining water, until someone proves by actual experiments that the water can certainly and cheaply be found. The writer has seen water for domestic use carried a distance of 26 km., when a well driven on the spot 4 m. deep would have obtained all the water required, and of excellent quality. Other cases are reported where the water had to be carried as much as 40 km. The manufacturers of some cheap forms of driven wells and pumps could build up a good business in the interior of Bahia by putting down two or three such wells, and showing the people how to use and care for them.

Soils

The soils of this region are naturally divided into the alluvial soils of the large rivers, the soils of the limestone areas and the soils of the area of crystalline rocks. The other formations have yielded each its own residuary soil, but these areas are of minor importance.

The alluvial soils of the Rio São Francisco are as fertile as such soils ever are and their proximity to an unfailing water supply in that great river makes them especially desirable for certain kinds of agriculture.

The limestone soils are as fertile as can be found in any part of the world, and over enormous areas they stretch as far as one can see like great prairies with just enough slope to drain them well. Unfortunately there is very little of this excellent soil now under cultivation. Along some of the streams like the Rio Salitre, Rio Jacaré and Rio Verde, the narrow flood plains of those streams are planted in sugar cane, in corn, or cotton, but over most of these plains the aboriginal *catinga* forests still grow undisturbed.

In the area of the crystalline rocks the soils are not so good as those of the alluvial plains or of the limestone regions. Still they support a considerable population. Cotton is grown in small patches, sugar cane flourishes along the streams and much coffee is grown in the mountainous districts. Unfortunately modern agricultural machinery is unknown. Not a single plow was seen in the thousands of miles traveled by our party. Almost all agricultural work is done by hand with large, heavy hoes.

Mining Laws of Bahia

Persons wishing information concerning the details of the mining laws of Bahia should consult law 624 of Sept. 9, 1905, of that State, and the general mining regulations relating thereto. These regulations were translated and published in English by *The Brazilian Review* at Rio de Janeiro in 1907. Space will not allow any extended quotations from or discussions of the mining laws and regulations. The following points may be of interest:

Unless otherwise stipulated in the original grant the State owns the minerals on private lands, in the beds of navigable streams, all lands classified by law as diamond lands and all abandoned claims. Persons wishing to do prospecting on State lands must obtain formal permission of the government; such permission may not be for more than 24 months, and the area to which prospecting is confined must not exceed 1000 sq.km.

The discoverer of mineral deposits is required to have surveys made and registered and a fee is charged. When the applicant owns the land, the fee is 50 milreis (about $16); when he is not the owner of the land, the fee varies from 200 to 2000 milreis (from $66 to $660.) When a mine is on private land and cannot be purchased, the State may expropriate it. Concessions and leases can be transferred only with the previously obtained consent of the government.

Most minerals taken from mines are taxed on their gross values at rates varying from nil to as high as 50 per cent. on monazite sands. The tax on diamonds and gold is from two to ten per cent. on the gross values at the mines. Until Sept. 1915, iron and manganese mines are exempt from these taxes. The government may make differential rates for the purpose of encouraging an industry.

Foreigners are subject to the Brazilian laws and courts in matters relating to mining operations the same as if they were Brazilians. In case of lawsuits against mining establishments embargoes may be placed upon the product of the mine, but not upon the establishment itself. Mining operations are encouraged by expropriations of land, water and timber required for the operation of mines and by preferences in the concessions of water rights.

General Observations

The writer finds so much misinformation regarding Brazil in general that he uses this opportunity to correct some of it. Persons who expect to do business in Brazil should endeavor to see things in a large way, and they should make up their minds to conform to a reasonable extent to the customs of the country. Those who are not willing to make such small concessions should not go there.

For those who have business in the interior it is worth remembering that wagons are but little used, and consequently there are but few wagon roads. Freight that has to go into the interior beyond the railway lines must generally be carried on mule back. For this reason everything should be so packed that it can be readily loaded on animals and can withstand the bumps and kicks to which such packages are usually subjected.

The climate of the mining regions is for the most part remarkably fine. Reference is here made to the interior of Bahia and to Minas Geraes and Goyaz. Being in the tropics, it is to be expected that the climate is a hot one, but these regions are elevated and during most of the year are dry and healthful. Along some of the rivers there is malaria especially during certain seasons.

Nearly all kinds of supplies required by prospectors and miners can be had in Rio de Janeiro. Many such supplies can also be had in Bahia and other large cities but one cannot always count on finding special forms of machinery, transit instruments and the latest devices of every kind. When

large quantities of any one thing are required it is hardly safe to depend on the local markets, except for food, clothing, lumber and such things as the country itself produces or are in constant demand by the people.

Labor is cheap and when promptly paid and properly treated it is very good. In the manganese mines of Minas Geraes unskilled labor is paid at the rate of about a dollar a day for a 10-hour day. In the vicinity of Bahia laborers get about 75c. per day. Owing to the uniformly high prices in the diamond district, labor there is somewhat higher.

The language of the country is not Spanish; it is Portuguese. And bad Spanish is not good Portuguese. Neither will some other language do just as well. In the largest coast cities one finds many foreigners who speak English, French, German, Italian and almost any other language, but those who have business to transact with the government, or with the people, or who have to live in or travel through the country must speak the language with some sort of fluency or they must pay the price for their inability to speak it.

Gaseous Currents in Meyer's Tangential Chambers

By V. P. Davis*

In *Zeitschrift für angewandte Chemie*, Nov. 6, 1908, Dr. K. I. Beskow, of Helsingborg, describes a series of experiments, which were made with a view to proving that the gaseous currents in Meyer's chamber system really follow a tangential course, flowing in a circular path along the chamber walls.

The experiments consisted in placing a piece of glass tubing about 2½ in. in diameter and 1 ft. long horizontally at various points and in different positions within the chambers and determining the quantity of acid condensed in each instance in equal periods of time. The tube was bent up on the lower edge at each end to form a "boat" or receptacle for the acid, and in order to increase the condensing surface, a spiral of glass was fixed within the tube.

The different positions of the tube were as follows: In the entrance pipe, parallel and perpendicular to the gas current; in the chamber about 24 in. above the bottom lead, 20 in. from the side lead and 85 ft. from the entrance pipe, parallel and perpendicular to the side lead; half way between chamber top and bottom, 20 in. from the side lead, and about 47 ft. from the entrance pipe, parallel and perpendicular to side lead.

The distance from the entrance pipe is taken along the periphery of the chamber. The chambers are cylindrical, 9.8 m. (32 ft.) high and 9.6 m. (30 ft.) in diameter. In the entrance pipe the tube condensed 8.8 gram H_2SO_4 when parallel, and 3.7 grams when perpendicular to the gas current, or in about the ratio of 2½ to 1. Within the chambers the ratio of condensation in the tube (parallel-perpendicular) varied from 2½ to 3½ : 1.

Beskow aptly terms the position of the tube when perpendicular to the side lead as the "radial" position. He shows several interesting diagrams plotted from the table of results and draws the conclusion that there is unquestionably a strong tangential motion of the gases within the chambers.

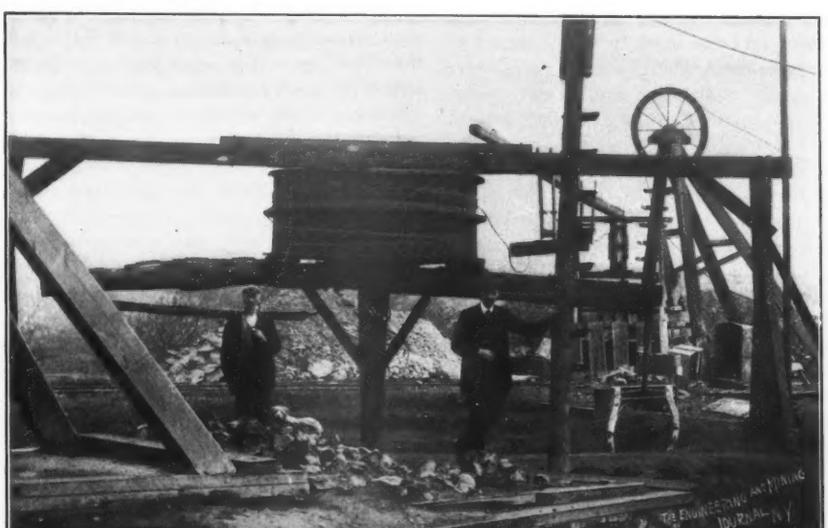
It has been stated that the good work of the Meyer system is due rather to greater hight than to any actual tangential current of the gases, but the foregoing experiments would indicate that Dr. Meyer's claims rest on a most substantial basis.

*31 Union Square, New York.

A Mexican Malacate in England

By H. Maplethorpe*

The accompanying illustration is from a photograph of a horse-power winding drum that has been in use for many years at the Forge colliery, Forge Lane, Wednesbury, Staffordshire. The drum, or malacate, as it is called in Mexico, has been superseded by a modern steam hoisting plant, but is still kept in reserve, ready for use. It is used from time to time for sinking.



MALACATE IN USE AT FORGE COLLIERY, STAFFORDSHIRE

*2 Salisbury street, Walsall road, Darlaston, Staffordshire, England.

The Tasmania Gold Mining Company

The report for the twelve months ending Sept. 30, 1908, has been issued. The results of the year have not been profitable, as, notwithstanding gold production of a value of £128,646, the accounts show a small adverse balance. The number of tons milled was 70,272, giving a yield of 36.6s. per ton. The reduction works consists of a stamp mill with a chlorination and cyanide plant. Additional cyanide plant is being considered to take the place of the chlorination process, which is expensive to run.

The development of the mine at the bottom, or 1250-ft. level, has been disappointing, but it is hoped that it is merely a poor zone that is being passed through, and that the lode will improve at greater depth. The ore reserves are only 59,125 tons, and it is evident that development work wants pushing.

The mine is heavily watered, but the pumps have been equal to the work given them. The heaviest flow of water on one day was 4,894,760 gal., or 3400 gal. a minute. This amount of water makes pumping charges a serious item, the total for the year being £19,186, which is about 18 per cent. of the operating expenditure at the mine.

The Rising Sun Oil Company is preparing to build a large refinery at Hakata, Japan. It is probable that oil from Borneo will be used principally.

According to statistics collected for The Mineral Industry, the production of alundum in the United States in 1908 was 3,160,000 lb., valued at $189,600, against 6,751,444 lb., valued at $405,086 in 1907. This abrasive substance is made only at Niagara Falls, and by the Norton Emery Wheel Company, of Worcester, Mass. It is used in the manufacture of artificial corundum for grinding wheels.

Gold and Other Minerals of Eastern Siberia

The Province of Baikal Has Rich Gold Quartz Veins; Amurski Oblast Possesses Placer Deposits from Which Gold Is Won by Primitive Methods

BY S. F. G. WHITE*

In this article I shall deal only with those portions of eastern Siberia that I have visited. On one trip I had occasion to investigate reef mining in this little known country.

Province of Baikal

The following described quartz mines (in the true sense of the word) are the only ones in the province of Baikal that have been systematically worked by Russian companies:

1. A stockwerk formation of a granitic nature with a pay streak 35 ft. in width, situated on the slope of a hill and dipping at an angle of 30 deg. The ore varied from 4 dwt. to 4 oz. gold per ton. Adits were driven on several levels, the total length being over 1500 ft. One shaft was sunk at the base of the hill to a depth of 110 ft. to water level when operations were abandoned. Following the first operation, a French engineer attempted to work the mine as a quarry, the latter method destroying all timbers and completely closing up all approach. A mill of 24 stamps of 640 lb. each was built on the creek side. Most of the tailings were dumped into the creek without regard to their possible value. Copper plates were used in the mill. The stamps were all of local make and most of the plant was of wooden structure.

2. A quartz vein in a schistose formation traversed by dikes of granite. The vein traversed both formations having a width of from 1½ to 3 ft., striking northwest and dipping at an angle of 25 deg. This mine was worked during a period of 13 years and has produced 80,855 oz. of gold. These figures are taken from the company books, kept according to the laws of the country. One level was driven through the hill a total length of over 2000 ft., of which 1400 ft. was stoped out. A lower level was driven to a length of 1200 ft. when operation ceased. No connection was made. Great difficulty was experienced in inspecting this mine owing to levels being nearly full of ice. The timbers, however, were all sound and the vein still well defined. In this case the mill was built in the bed of a creek about two miles distant, and the ore was hauled in carts. The tailings were dumped into old placer workings and neglected. A cyanide plant was operated with which 1575 oz. gold were extracted. Sumps and percolators were all made of wood, standing in the open, and the result of a winter's freezing in a semi-arctic country can well be imagined.

3. Situated 3½ versts from the above mine is a vein having a width, where exposed, of 1 ft. 4 in. Its strike is north 50 deg. east, and the dip 50 deg. This mine was worked during a period of five years and crushed 5017 tons that averaged 12 dwt. 19 grains. But little work was done. One level was driven to a length of 600 ft. and a lower one 200 ft., when the mine was closed owing to a dynamite accident. In the immediate neighborhood of these two mines are four other auriferous quartz veins. I was told by an old workman that the rock was so rich in places that it resembled a brass samovar, and that the miners used to steal the stone and crush it at home with a pestle and mortar. Labor is plentiful and cheap, while supplies can be freighted from the railway at £4 9s. per ton. Timber and water are obtainable with little difficulty.

About 200 versts from the above mineral belt other quartz reefs have been located, so far eight in number, and of various widths. The vein matter consists of quartz, iron and arsenical pyrites, with gold finely divided and at times visible to the naked eye. The veins have a general strike of north-northwest, with a dip of 45 deg. Tests made by amalgamation only are reported to have shown in many cases very high results. Assays of pyritic ore showed no visible free gold and gave results of 3 dwt. only. It is worthy of note to remark that all these veins are immediately adjacent to what were formerly very rich placer workings. The mines are worthy of a careful study from a dredging point of view.

Other Mineral Resources

Of other minerals in the Baikal province, graphite, asbestos, copper, tin, iron and coal exist in payable quantities. Tin was discovered for the first time on the Onon river in 1811. Numerous excavations spread over the surface, especially in places where the deposits were found to be particularly rich, indicate that the mining of tin was once carried on in early periods by the natives (Bourists). It appears that articles made of tin which were found to a very large extent in the possession of the native population were the chief objects of local trade, whereas there are but very few traces of these articles having been imported from Western Russia during the early part of last century. Tin was worked in 1813, 1815 and 1817 on both sides of the Onon river. The ore was mostly tinstone accompanied by quartz. Smelting was done in ordinary small furnaces. The first placer deposit of tin was discovered in 1829 by a certain Kooreagin, the leader of a prospecting party. The method applied for saving the tin was the same as that applied to gold. The average amount extracted per ton of gravel amounted to 363 lb. These notes are taken from a very old Russian book which ends by stating that owing to the high cost of production in these days the mines were closed down in 1843. Most of the placers in the Baikal province have been worked by the Czar's cabinet with convict labor. The manner of working the gravels was of the most primitive type and a big loss in gold was the result. Steam-thawing methods are absolutely unknown in the country, and wet ground is passed over unless there is a very small overburden. Owing to the unsystematic method of taking out the pay dirt, a lot of good ground is lost.

It will be noted in my remarks on the Baikal province, that I have dealt only with mines which have been worked and located; it was not my aim to look for new prospects in so vast a country. Attention is drawn to the fact that all my travels were south of the railway as far as to the Mongolian frontier. To the north of the railway I could hear of no quartz mining ever having been carried on, with the exception of that of one English company at present working in the Nerschinsk district.

Province of Amurski Oblast

Descending the Amur river, the province of Amurski Oblast is entered at the village of Pokrovka, a day's journey by steamer from the town of Srèlinsk, the Siberian terminus of the Trans-Siberian railway. This railway is now being constructed along the left bank of the aforesaid river to connect with the Vladivostok branch line at the town of Kbarovsk. The whole of this vast province is a network of rivers and creeks, in all of which gold is found in varying quantities. Ascending one of the largest tributaries about 600 miles, I was enabled to visit many of the old placers from which enormous quantities of gold have been recovered. The extent of these workings is so great that many months could be spent in simply taking a casual look at them. On one river the operations being carried on were so interesting that I give in detail a description of them. The deposit is of an average width of

*Haye's Cottage, Hayes Road, Bromley, Kent, Eng.

150 yd. and is from 2½ to 14 ft. in depth. The stream flows at from 1 1/7 to 1⅓ miles per hour. Work is conducted every summer by gold robbers, or snipers; in some cases they work the banks, in others they work the bed as far as they are able to reach it by wading out into the water, one man shoveling up to another who washes by the simple panning method. On one spot there were 12 hand-dredges at work, each dredge consisting of two rafts, one 13 yd. in length, the other 7 yd. in length. On the former was the dredge, consisting of a shovel 21 in. deep by 17½ in. wide. On one end of the raft was a windlass with a wire rope attached to the shovel by two chains, one on each side. In the center of the raft for a distance of 10 yd. was an opening 2 ft. wide. The shovel was taken to the far end of the opening and rammed into the bottom of the river by a man who stood on a piece of wood, or rung, let through the shaft; thus the shovel was kept down while the windlass dragged it along the bottom the distance of 10 yd. and to the surface. On the second raft were a long tom and hand pump into which the gravel was dumped and washed, the gold being caught on blankets with 1-in. riffles.

These machines were working in 11 ft. of water. The gravel washed was purely surface, but in spite of this each machine averaged a saving of gold amounting to 328 grains per day of 10 hours. One clean-up, which I personally checked, showed a recovery of 26 grains per cubic yard. This, no doubt, was a particularly rich patch, but sampies which I took many miles lower down the same river, from the banks at a depth of only 8 in., showed returns of 13 grains to the ton. One important feature of this river and others in the neighborhood is that they never freeze to bed rock in mid-stream. The method above described is carried on during the months of May, June, July, August, September and part of October. Access to these places is easy, steamers running all the way from Novi-Nikoliesk, at the mouth of the Amur, as also from Kbarovsk, the aforesaid railway terminus of the Vladivostok & Amur river lines. All supplies can be obtained at small cost. Timber is plentiful and labor, formerly scarce, is now obtainable, owing to the great inrush of emigrants from European Russia.

No quartz mining has, as yet, been carried on in this province, but as evidence of the gold being of local origin, I saw a Russian empty out two saddle bags containing about 40 lb. of coarse gold, two-thirds of which had been hammered out flat to get rid of the accompanying quartz. I was shown samples of quartz containing visible gold, which came from a reef that was being opened up some distance out of my way, and from assays and plans shown me at a later date, it was surprisingly rich. I regret to say that scarcity of time prevented my visiting the district. The country is entirely schistose and is traversed by dikes of granitic rocks and intrusive masses of gneiss, while large areas are covered with the detritus of primitive rocks. Of other minerals large deposits of copper and beds of coal have been located, but as yet no development work has taken place. With the advent of the Amur river railway, great changes will surely take place in this province.

Other Provinces

The Primorski Oblast, or Maritime, province is as yet but little explored, owing to the Crown's past unwillingness to allow mining or prospecting. From information obtained from old Polish political prisoners, I understand that conditions will change, and as his Majesty, the Czar, has now seen fit to lift his veto and permit exploration, we may, before long, hope to hear of active mining operations. I could obtain but little information of the Yakutsk province, and owing to its inaccessibility from the Pacific sea coast, I decided to leave it alone.

In order to bring out the importance of Eastern Siberia as vividly as possible, I would lay stress on the fact of its easy accessibility from Vladivostok as a seaport, its great water ways for internal communication, its railroads now in active construction, and its cheap labor and abundance of fuel. Having worked there summer and winter and seen it under every conceivable condition, I am, I think, fully justified in expressing this opinion. I can but end these few words in expressing my thanks to the people of the country, who were always ready and willing from the highest to lowest to help a foreigner over any little difficulty and give him of their best in hospitality.

Laboratory Methods for Making Alloys of Iron and Vanadium*

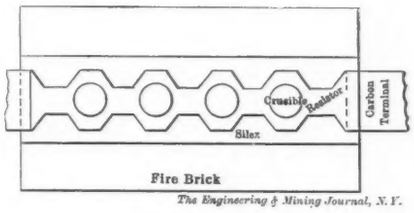
By W. L. Morrison†

Binary alloys of pure iron and vanadium free from carbon can be conveniently made by two methods: (1) Goldschmidt s method, using pure aluminum and hammer scale from puddled iron, and mixing a little ferrovanadium with charge. (2) By use of electric resistance furnace, using a crucible in the resistor to melt puddled iron and ferrovanadium.

Goldschmidt's process is very simple and requires but little apparatus. The iron oxide or hammer scale is analyzed and sufficient aluminum is added to combine with the oxygen present; usually 5 per cent. excess is added on account of oxidation of some aluminum by oxygen in the atmosphere.

The reaction between the oxide and aluminum is brought about by external heat, or by ignition of a mixture (barium peroxide and aluminum) which is usually placed at the bottom of the charge and electrically ignited. For small charges of 2 lb. or less, it is most desirable to apply external heat in order that the reduced iron may separate cleanly from the slag. If internal ignition were used the cold walls of the containing vessel would chill the molten iron before it separated from the slag. A gas furnace or an ordinary forge is very convenient for heating the crucible containing the charge. The resulting alloy upon solidifying may then be removed and forged in a bed of quicklime out of contact with carbon since alloys are to be carbon free.

The electric furnace was of the resistance type carrying four 1-lb. magnesia crucibles. The resistor was baked carbon, 16 and 17 mesh in size. The terminals were of 2x4-in. carbon. Carbon terminals were used in preference to graphite on account of their low heat conductivity. The walls of the furnace were of common firebrick, the interior being lined with silex. The furnace was covered with silex slabs to prevent radiation losses. In order that the bottom of the crucibles might heat evenly, the crucibles were placed on a small graphite block. A thin layer of decomposed graphite was used between resistor and carbon terminals to give better contact. The construction of the interior of the furnace, as shown in the accompanying illustration, is for the purpose of giving uniform resistance throughout the bed.



RESISTANCE FURNACE

The source of current was a 33-kw. Westinghouse alternater delivering 1100 volts. Six transformers of ordinary line type were connected in parallel and the secondary coils so connected that 110 or 55 volts could be used. During all the runs 110 volts were used. The rise in amperage was so slight that the iron melted before the wattmeter registered 20 kw. The time required to melt 1 lb. of puddled iron in each of the four crucibles was 5½ hours. Power used was 65 kw.-hours. The puddled iron was introduced into the crucibles before the heat, then ferrovanadium after the melt. Many different crucibles were tried and the magnesia was the only serviceable one.

*Brief of thesis work done at Case School of Applied Science.

†1052 East Twenty-fourth street, Erie, Penn.

Determination of Lead and Cadmium in Spelter

By Eric John Ericson*

In a former article in the Journal, July 25, 1908, I described a rapid technical method for the determination of lead in spelter, requiring only about one hour's time for execution. This was the first application of my method to spelter and may be designated as method No. 1. I desire now to present our latest scheme, or method No. 2, which gives lead to the thousandth of a per cent. whereas the first gave accurate results to 0.01 per cent. Besides greater accuracy the new method affords at the same time a separation from cadmium since the filtrate from lead may be used for the former's determination.

Solution of the sample is here effected by dilute hydrochloric acid according to Oswald Günther[1] or dilute sulphuric acid (Nissenson[2]) until nearly all zinc is dissolved. The insoluble lead and cadmium is filtered off and dissolved in dilute nitric acid. This procedure makes it possible to operate on a larger sample, and each 0.1c.c. of the potassium permanganate solution (0.568 grams to the liter) equals 0.001 per cent. lead. Particular care must be taken not to dissolve the sample too fast as there is danger of cadmium going into solution. In cases where lead alone is wanted the dissolution may be hurried some without impairing the accuracy. In this laboratory it is customary to run duplicate determinations on spelter, chiefly to guard against and detect any possible loss of cadmium.

The substitution of trichloracetic acid according to Fox[3] for any one of the mineral acids usually employed in separating cadmium and zinc, has been found advantageous, since it is not dissociated to the same extent as hydrochloric or sulphuric acids, and even concentrated solutions do not prevent the complete precipitation of cadmium. In the case of mineral acids the strength must be kept within narrow limits as is well known. A slight excess prevents the precipitation of cadmium, while insufficient acid causes much zinc to be precipitated along with cadmium and makes several reprecipitations necessary. By means of trichloracetic acid only one reprecipitation is called for, unless it has been found that more zinc remained undissolved originally than was aimed at, as may be seen later.

Method No. 2 for Spelter

Weigh out 19.2 grams of the sample and place in a No. 3 Griffin beaker. Add 50 c.c. distilled water, and 50 c.c. hydrochloric acid (1.10 sp.gr.); warm gently and from time to time add more dilute hydrochloric acid until nearly all zinc is dissolved and only 1 to 1.5 grams remain, plus the insoluble lead and cadmium. Do not hurry the dissolution when cadmium is to be determined. A good plan is to add insufficient acid at the start and allow to stand over night. In the morning, continue the addition of acid gradually and give it time until the proper stage has been reached. Filter off metallics and wash thoroughly with hot water (not necessarily until all chlorides have disappeared).

Transfer whatever metallics are on the filter back into beaker by means of a fine jet of water. Now add 10 c.c. concentrated nitric acid, boil until brown fumes cease to appear and filter if traces of tin or antimony are indicated, which is seldom the case. If filtered and washed the volume will probably be large enough. If not add 75 to 100 c.c. water, 30 c.c. strong ammonia and 4 to 5 grams solid ammonium persulphate. Should the lead be unusually high, say over 1 per cent., it is best to add the persulphate before the ammonia. This insures perfect oxidation even where lead runs high, but requires a standardization of the factor, as in the case of lead concentrates. Boil five minutes, allow the liquid to settle 10 min. and filter while warm through double 11- or 12.5-cm. filters. Wash four times with hot 10-per cent. ammonia water and five times with hot water.

Transfer filter with precipitate back into beaker in which precipitation was made; add 25 or 50 c.c. hydrogen peroxide solution (10-40 c.c. H_2O_2 U. S. P. strength to the liter) depending on the percentage of lead. Stir until dissolved, add 15 c.c. nitric acid (1.20 sp.gr.) plus 100 c.c. water and titrate the excess of hydrogen peroxide by the standard permanganate solution. For instance if 25 c.c. H_2O_2 blank require 60 c.c. $KMnO_4$, and the sample 28.5 c.c., then the lead equals 0.315 per cent. The accompanying examples taken from practice show how closely the new method checks with the chromate determination.

	Ericson Method. Per Cent.	Gravimetric[4] as Chromate. Per Cent.
Refined spelter	0.082	0.083
Refined spelter	0.043	0.044
Prime western spelter	0.530	0.538
Prime western spelter	0.533	0.531

Cadmium Determination

For the determination of cadmium, evaporate the ammoniacal filtrate from lead until it is nearly neutral and zinc and cadmium commence to be precipitated, add 35 c.c. dilute sulphuric acid (1:3) and boil down to about 150 c.c. volume. Saturate with hydrogen-sulphide gas, add 25 c.c. water and warm. Sometimes it is necessary to add a few cubic centimeters of dilute ammonia to start precipitation. Allow the precipitate to settle, filter through double filters and wash. Test filtrate for cadmium and if none is present reject it. Redissolve the cadmium sulphide, contaminated with zinc sulphide, in dilute hydrochloric acid (1.10 sp.gr.) and wash with water. If copper is present its sulphide remains insoluble on the filter. It may be ignited and weighed as copper oxide.

The filtrate containing cadmium and zinc chlorides is neutralized with dilute ammonia, and trichloracetic acid dissolved in water added until the precipitate is redissolved. Dilute to about 150 c.c. volume and reprecipitate, adding hydrogen sulphide and water alternately. Settle and determine by any one of the usual methods,[5] preferably as sulphate or phosphate.

Should the color of the cadmium sulphide from the sulphuric-acid solution be yellow, it indicates considerable zinc, which may be largely eliminated by boiling the solution of the mixed chlorides to expel hydrogen sulphide, adding sodium hydroxide in slight excess to precipitate cadmium, filtering, washing and redissolving the cadmium hydroxide on the filter in trichloracetic acid, diluting and reprecipitating with hydrogen sulphide, when a pure cadmium sulphide will be obtained. Should the duplicates not agree, reprecipitate the one giving the highest result since it may still retain some zinc. If still too far apart, repeat the entire analysis.

Higher Factor for Method No. 1

In this connection I wish to add to my previous article concerning ores that further investigations have shown the factor in the equation, 1.92x iron value of permanganate = lead, to be correct on spelter and alloys wherever a direct determination can be done, but it is too low on ores, owing to slight losses as lead sulphate and carbonate in the preliminary separation. The factor 1.95 is recommended, hence weigh out 1.95 grams instead of 1.92 grams as originally suggested. As the lead content in the zinc ores is usually very low, the difference in factor does not cause any serious error, but in lead concentrates it would be considerable. This was realized at the outset and, therefore, suggested to check the potassium permanganate solution against a standard lead ore put through under identical conditions. To insure perfect oxidation in high-grade lead concentrates, add the ammonium persulphate to the nitrate solution before making it ammoniacal.

According to the fourteenth annual report of the Rand Mines, the cyanide works treated 3,195,242 tons of ore during 1908. The yield was 391,736 oz. of gold.

---

*Chief chemist, Edgar Zinc Company, St. Louis, Mo.

[1]Bericht der Internationalen Analysen-Kommission an der VI Internationalen Kongress für angewandte Chemie, Rome, 1906, page 51.

[2]Ibid.

[3]*Journ.*, Chem. Soc., London, 1907; page 964.

[4]Fillitz, Praktischer Leitfaden für Zinkhütten Laboratorien, page 27.

[5]Buskett, *Eng. and Min. Journ.*, April 18, 1908.

Bitumen and Oils in West Africa

By T. Hugh Boorman*

Eearly in 1906 much interest was evinced in London at the discovery of bituminous deposits in Lagos and southern Nigeria. Syndicates were at that time marketing stocks in companies for their development. I was at that time much amused at an effort being made to compare the asphaltic oil deposits with Trinidad and Bermudez asphalts and at the queer errors that ensued in the attempt to make comparative analyses.

Samples of "Nigeria asphalt" then received were described as a mixture of water and gas, bitumen, organic matter (not bitumen) and fine mineral matter. These constituents were present in the following proportions: Water and gas, 23.33 per cent.; bitumen, 45.75; organic matter (not bitumen), 2.90; mineral matter, 28.02; total, 100 per cent. The asphalt was first found in one concession comprising about 300 sq.m., bounded on the west by the Oshun river, on the east by the Oni river, and on the south by the Lekki lagoon; the second concession, comprising 100 sq.m., was situated north of the village of Aiye, approximately 12 miles by land and 120 miles by water from Lagos.

Another concession is near the Oluwa river. Here a deposit of bituminous grit outcropping in the slope at the foot of a bench is to be found. The top of the stratum was about 6 ft. above the level of the low ground near the river. A small shaft was sunk in the bituminous stratum for a depth of 6 or 7 ft. Some pieces cut from the ground at the top of the shaft yielded from 15 to 74 per cent. bitumen. This area is about 15 miles by land and 120 miles by water from Lagos.

An accompanying table shows the comparative composition of crude Trinidad, Bermudez and Nigeria asphalts. The areas of the deposits compare as follows: Trinidad, 127 acres; Bermudez, 900 acres; Nigeria, 216 acres (located in 1906). Other tables show a comparison of refined asphalts, and a comparison of the ultimate composition of pure bitumen from asphalts.

West Coast of Africa

From reports made in December, 1908, to various companies, it appears that petroleum oil with an asphalt base is probably present in immense quantities on the west coast of Africa, and that the material originally proposed to be marketed as bitumen is of the nature of Santa Cruz bituminous sand, since the chairman of the Nigeria Bitumen Corporation stated that "the samples of bitumen which were tested showed the presence of sand, which had evidently been torn out of the rock in its upheavel, "and that" the light oil which that sand contained had evaporated and left it in the form of bitumen." They had endeavored to extract the bitumen, but met with great difficulties, the greatest of these being that of transport. They believed that when the colony opened out they would be able to make a profit on their bitumen, not only by exporting it, but in its use in the colony itself.

Sir Boverton Redwood said that when the previous meeting was held he emphasized the fact that the company was engaged in determining whether or not petroleum was obtainable in Nigeria in commercial quantities, and he now had the pleasure of congratulating them upon an affirmative answer of a most unqualified character having been given to that question.

At a meeting of the Nigeria Investment Company, held in London on the same day, C. H. Harley Moseley, ex-colonial secretary of Lagos Nigeria, said that at the recent Franco-British exhibition, while the known products of southern Nigeria were very fully represented at the exhibition, there was one product that had only recently been discovered, but the existence of which has long since been more than suspected, which did not figure among the exhibits; that product was mineral oil. Mr. Moseley said: "Gentlemen who are well acquainted with facts and can speak authoritatively have made a profound and practical study of the matter, and have satisfied themselves by expert reports and by all those other investigations which are necessary before one can class a new discovery as a commercial asset. These gentlemen have told me that they are satisfied in every respect, and in what I am saying now I am taking it for granted that commercially and colloquially speaking, we have struck oil. I am taking it for granted not only that oil has been found, but that the conditions surrounding this find are of a nature to make it possible to place it on the market in competition with the oils of Russia and America."

Exploration and development work had already been carried out by the Nigeria Investment Company for two years prior to deep drilling, and test bore holes were put down under the superintendence of Bernard A. Collins, a mining engineer. This gentleman says: "I am now satisfied that the oil will be found by deep boring, and that the bitumen can be mined in unlimited quantities and of a high grade, and that the most important point now to be decided is that of outlet toward a shipping port."

The directors of the Nigeria Bitumen Corporation, Ltd., in their recent annual report to the shareholders state: "The fact that after passing a small show of oil in sandrock, oil was struck at a depth of 633 ft., which rose to within 98 ft. of the surface and did not decrease after four days' baling; that after getting the casing down farther and drilling an additional 26 ft. the manager reports that the oil is increasing, and that the production was 145 bbl. per day, is absolute proof that the quantity of oil in those strata is large, and that there is considerable pressure behind it."

According to the Right Hon. W. S. Churchill, late under-secretary for the Colonies, the Colonial Office has been impressed with the potentialities connected with obtaining mineral oil, as is shown by the fact that even creating a precedent was not permitted to stand in the way and a considerable grant of public funds to aid in drilling operations for mineral oil was authorized. That the Colonial Office and its advisers were not mistaken in their prognostications is evidenced, it is claimed, by the fact that oil was found in the western Nigeria, in addition to the bitumen November, 1908, and every succeeding cable relating to the further boring operations goes to confirm the view that southenr Nigeria, in addition to the bitumen which is to be found over large areas, is in the very near future to become a petroleum producer, with all its numerous uses and the by-products which follow in the wake of this important natural development.

It is proposed to send out at once a staff of practical oil drillers from Canada. It would seem to me more desirable to have them sent from California as I cannot but believe that the deposits discovered are of a very similar character to some of those on the Pacific coast.

AVERAGE COMPARATIVE COMPOSITION OF CRUDE TRINIDAD, BERMUDEZ AND NIGERIA ASPHALTS.

Composition.	Trinidad.	Bermudez.	Nigeria.
	Per Cent.	Per Cent.	Per Cent.
Water and gas	29	28	24
Organic matter (not bitumen)	7	3	3
Mineral matter	25	2	28
Bitumen	39	67	45
Total	100	100	100

COMPARISON OF REFINED ASPHALTS.

	Trinidad.	Bermudez.	Nigeria.
	Deg. F.	Deg. F.	Deg. F.
Softens at	180	160	75
Flows at	190	170	110
	Per Cent.	Per Cent.	Per Cent
Bitumen	56.4	95.0	70.68
Organic matter	6.7	2.5	9.10.
Inorganic matter	36.9	2.5	20.22
Total	100	100	100
Sulphur	6.2	4.0	1.50

COMPARATIVE TABLE SHOWING ULTIMATE COMPOSITION OF PURE BITUMEN FROM ASPHALTS.

	Trinidad.	Bermudez.	Nigeria.
	Per Cent.	Per Cent.	Per Cent.
Carbon	82.33	82.88	80.48
Hydrogen	10.69	10.79	9.29
Sulphur	6.16	5.87	1.50
Nitrogen	0.81	0.75	0.68
Oxygen	.....	.....	8.05
Total	99.99	100.29	100.00

*Civil engineer, 59 Pearl street, New York City.

Amatrice, A New Gem Stone of Utah

This Matrix Stone Consists of Variscite and Chalcedony, with Wardite or Possibly Other Hydrous Aluminum Phosphates, and Quartz

BY EDWARD R. ZALINSKI*

Recently a gem stone has appeared on the Salt Lake and eastern jewelry markets which on account of its beauty and individuality is attracting considerable attention. Amatrice is essentially a matrix stone, and consists of the minerals variscite and chalcedony, with wardite or possibly other hydrous aluminum phosphates and cryptocrystalline quartz. The amatrice locality was discovered in 1905, but until the past year little development or mining was attempted. The first locations were made for copper but assays showed no copper present and the claims were abandoned. It is the purpose of the present article to briefly describe this new gem material together with its geological occurrence.

The name "Amatrice" was given to it by the owners because it is fittingly descriptive of the stones. It is derived from "matrice" a synonym for matrix, prefixed by the letter "A" of the word American to denote their American origin. Up to date they have been found at only one locality in Utah, though variscite of a different type is found at another point.

In "Mineral Resources" for 1894, Sixteenth Ann. Report U. S. G. S., pt. 4, p. 602, mention is made of a compact nodular variscite found in Clay cañon about 2 miles south of Mercur, Utah. The name utahlite was suggested for this occurrence of variscite, but it is also known as chlor-utahlite. The amatrice locality is about 20 miles northwest of Mercur and is mentioned under utahlite, in "Mineral Resources" for 1905, pp. 1323 and 1350, as a new occurrence of this gem stone. The variscite here, however, differs in its physical character from that of the Clay cañon occurrence, and partly on this account and also from the fact that the name "utahlite" is very similar to "utahite," a basic ferric sulphate found in the Tintic district, the same amatrice was given to the variscite and associated minerals, from the locality under consideration. The gem is described by Douglas B. Sterrett in the advance chapter from "Mineral Resources" for 1907, pp. 42 and 43, under the heading "Amatrice or Variscite Matrix."

AMATRICE HILL IN CENTER FOREGROUND

OUTCROP OF TYPICAL QUARTZITE

Location

The amatrice mines are situated in Tooele county about 40 miles southwest of Salt Lake City and about 8 or 9 miles west of Stockton, on the S. P. L. A. & S. L. R. R. The property lies in the foothills of the Stansbury range, on the eastern slope, a few hundred feet above the valley. The ground slopes from Amatrice hill easterly over the old lake-bed terraces toward the railroad. Amatrice hill is a small rounded knob of elliptical shape, with greatest length north and south. It rises 200 ft. above the adjacent bench lands on the northwest side of Rush valley, and lies about 1½ miles north of Hickman cañon. By barometer the altitude is 5700 ft. The surroundings are arid, but some dry farming is done in the neighborhood. No water exists on the property, and at present is hauled a distance of 16 miles.

Geology

The country rock in the neighborhood of the amatrice deposits is limestone and quartzite. On the surface the limestone is a light grayish color with numerous silicious and cherty portions which weather out above the softer stone forming lumps and nodules. Where freshly broken the rock is dark blue. Amatrice is found in certain beds of this cherty limestone along fissures which strike north 20 deg. west (magnetic reading), and dip 70 to 80 deg. west. Northeast of Amatrice hill on the footwall side of the amatrice beds, silicious limestone appears but normal limestone is again exposed in a small gulch. The ground rises from here and the rock becomes more silicious going up hill, passing through beds of granular quartzite or sandy silicious limestone to typical quartzite at the top of the rise. A bed of the latter outcrops prominently about 15 ft. above the surface and for several hundred feet in length. All beds are conformable to the amatrice-bearing limestone. So far no amatrice has been found in the quartzite. Along the south side of Amatrice hill the limestone is fossiliferous. The bedding is well exposed and strikes north 20 deg. west dipping 60 deg. west. Fossils found here proved to be of Upper Carboniferous age.

Occurrence

Amatrice occurs in a crushed and frac-

*Mining engineer, University Club, Salt Lake City, Utah.

tured zone in the limestone which strikes approximately parallel to the bedding. It appears in places on the outcrops in green or yellowish concretions. Where exposed in the open-cut workings it is found in nodular masses from the size of a pea to several inches in diameter. These are intimately associated with silicious material, in many cases being cemented together in irregular bunches and coated and mixed with chalcedony. The rock is cut by fissures striking north 20 deg. west and dipping 70 to 80 deg. west. These appear to have been the mineralizing fissures and are the strongest ones noted. They show limonite staining and in some cases small particles of fresh pyrite inclosed in a matrice. Chalcedony is one of the most abundant minerals of the deposits, while fractured and iron-stained chert is common. A second set of fissures striking north 60 deg. east cuts the limestone bedding at nearly right angles and dips steeply to the north; they show no mineralization. The amatrice-bearing ground is of limited extent. The gem has been found only on the eastern slope of Amatrice hill, over a distance not more than 350 ft. in a north-south direction and roughly estimated 150 ft. east and west. Development work indicates the deposit to be of local origin. No gem in place or amatrice float has been found to the north or south. The vertical depth so far proved has been less than 12 ft. beneath the surface, but amatrice has been found lower down the hill 30 ft. vertically below the present workings.

Mineralogical Notes

As mentioned before, the chief constituent minerals of amatrice are variscite and chalcedony. Wardite and probably other hydrous aluminum phosphates occur, as do quartz and chert. Wardite and variscite occur together and furnish the chief coloring material. The color varies from pale green through all shades of green to deep green; the latter color is usually translucent. The related phosphates are yellow, gray and white, while in the matrix the chalcedony and chert vary from white to dark red, yellow and brown. An oolitic and wavy structure is sometimes apparent in both the variscite and matrix. Small nodules of variscite are cemented together with chalcedony and all possible combinations of these two minerals occur. Crushing and fracturing have taken place at successive periods, with subsequent deposition of minerals of different shades in the cracks and seams.

Amatrice is hard and compact; it breaks with a conchoidal to uneven fracture. Variscite and wardite are rated at 4 and 5 in the scale of hardness respectively, but so intimately are they associated with chalcedony and in places impregnated with it that the hardness approaches that of this mineral. A rock section under the microscope would show the thoroughness of this impregnation. In some cases it may be seen in hand specimens. Fragments of the apparently pure variscite will readily scratch window glass. The individuality and charm of amatrice which distinguishes it at once from normal variscite is due to the wide range of colors of the minerals composing it and the combinations of color and structure these minerals make with one another.

Development

Development consists of a tunnel and open cuts on the eastern slope of Amatrice hill and has exposed three distinct types of amatrice, in workings some distance apart. These types are called apple-blossom, cobweb, and jade. The apple-blossom type resembles white blossoms on a green background. It is due to fine concretions of variscite intimately mixed with portions of the white phosphate, and associated with chalcedony. Dark-brown chert adds contrast to the variscite.

The open cut where the cobweb type occurs is about 250 ft. southwest of the apple-blossom occurrence. In the face of the cut fissures striking north 10 deg. west and dipping 80 deg. west, carry nodules of yellowish phosphate material mixed with chert and chalcedony. Variscite may or may not occur in these nodules. When present it is irregularly distributed. Light-green variscite with a network of deep-green lines gives rise to the cobweb or turtle-back type, which occurs with a matrix of different colors. The cobweb amatrice is due to fracturing of one generation of variscite and matrix, and recementation with variscite of a different color or by chalcedony, with often hematite or limonite staining along the cracks. This type carries some deep translucent green variscite with a tendency toward the jade type.

In the jade type of amatrice the variscite is a deep translucent emerald to apple green and resembles jadeite in color. The open cut where it is mined is the farthest southwest of any of the present workings. A specimen from here showed the limestone almost entirely replaced by silicious material. The variscite is in nodular masses ¼ to ¾ in. in longest diameter, and also of irregular outline. The color changes are gradual or abrupt; the abrupt changes are often due to fracturing and displacement but also to deposition of variscite of widely different colors. On the border the nodules are frequently translucent green, and light green or nearly white in the center. They may contain fragments of chert or silicified country rock. The matrix is extremely silicious surrounding the nodules and carries large amounts of chalcedony.

Genesis

Regarding the genesis of amatrice the following points may be mentioned: The variscite and chalcedony were deposited in a crushed and fractured zone in the limestone and replaced the rock in the neighborhood of the mineralizing fissures. Pyrite in small fresh crystals and veinlets is sometimes present with the amatrice; it furnished the limonite by oxidation. Movement occurred during and after the deposition of the gem-forming minerals, and was one of the important factors in producing amatrice, though some of the peculiar structure cannot be assigned to this cause alone. A large amount of chalcedony was deposited and brecciation of both the variscite and matrix took place. The component minerals were deposited at successive periods and possibly under different conditions.

Production and Uses

Amatrice is used in all kinds of gold jewelry. The colors are in harmony with the color of gold and it is mounted in scarf pins, rings, cuff links, brooches, lavilliers, necklaces, pendants, etc. It is also used in art jewelry on account of the individuality of the separate gems. The extreme irregularity of the variscite, chalcedony, and cementing medium, with its hardness and capability of high polish, furnish material for an ideal matrix stone. After cutting and polishing it is difficult to find two gems alike. Amatrice is usually cut *en cabochon* or elliptical with a low convex surface. It is sold by the carat and ranges in price from $1 to $3.

According to "Mineral Resources," the production of finished gems from the material mined in 1907, amounts to about 20,000 carats. In 1908 the Occidental Gem Corporation reports production in the neighborhood of 45,000 carats, a portion of which was exported to Europe. During the latter part of the year they were unable to supply the demand on account of lack of manufacturing facilities. The company is now installing its own lapidary plant in Salt Lake City.

The oilfields of the island of Sakhalin, off the Siberian coast, have long been productive. A company composed of Russians, Germans and Chinese, has secured a concession to a large tract north of the town of Nikolaievsk, and will begin to explore it as soon as the necessary machinery can be secured from Germany.

The actual percentage of extraction of gold at the Rand Mines, in 1908, according to the fourteenth annual report, was 94.421.

Microstructure of Copper Examined with a New Etching Reagent

By Robert R. Abbott*

During 1906, in attempting to examine the structure of the contact between copper and steel, as formed in the various methods of rail bonding, I was confronted with the difficulty that none of the etching reagents in present use would bring out the structure of the copper sufficiently to permit the required examination, although the development of the structure of the steel side presented no difficulties.

FIG. 1

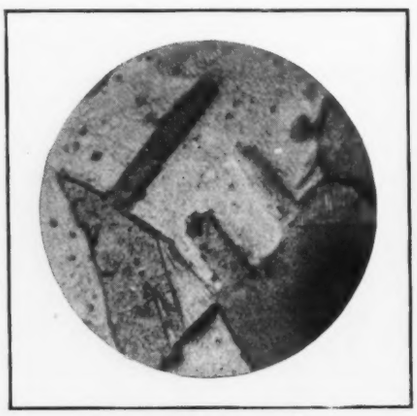


FIG. 2

FIG. 3

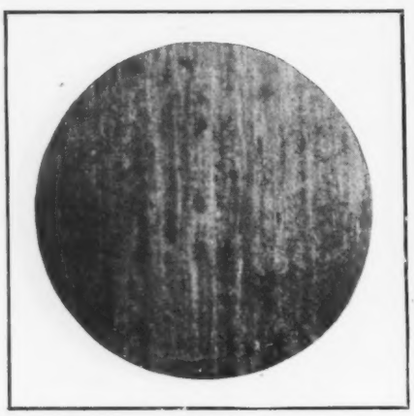


FIG. 4

FIG. 5

FIG. 6

The literature at hand was carefully reviewed in the hopes of finding some previous work along this line, but with little success. In fact, as far as I am aware the only previous microphotographs which have been published showing with any degree of clearness the true structure of copper were those of Professor Huntington, in the Journal, of Dec. 16, 1905. Professor Huntington etched his specimen with nitric acid. This reagent would not give detail enough.

I then began experimenting with various methods of etching and finally found that ammonium persulphate (NH_4SO_4) gave excellent results. The method of etching with it which has given the best satisfaction is to polish the section very carefully on the Sauveur machine and, after washing free from the rouge, place it in a dish of boiling water, add sufficient persulphate to make about a 10 per cent. solution. Allow it to boil until the brightly polished surface becomes dull and crystalline. This usually requires from one to 10 seconds. Wash the specimen and dry in the usual way with alcohol. Quite often a film of red oxide forms on the surface, which will disappear in a few seconds; if it does not, a slightly stronger solution will be required. This method gives very good results with copper alloys.

The accompanying photographs give a few examples of the structure of copper and also the structure of copper containing copper oxide and phosphorus. Fig. 1, 175 diameters, shows the copper after having been annealed five minutes out of contact with the air and just below the melting temperature. Fig. 2, 475 diameters, and Fig. 3, 875 diameters, are of cast copper. The different shades in the crystals are due to the various orientations of the crystal axes. The tendency to form what are apparently twin crystals is remarkable, in fact, sufficient etching has usually brought out traces at least of twinning on almost every crystal. This tendency decreases with the presence of very small amounts of copper oxide or phosphorus. Another peculiarity of the structure of pure copper is the fur-like appearance under the higher powers of magnification. In many cases this might be mistaken for a eutectic structure. Figs. 2, 3 and 5 show this excellently.

Fig. 6, 175 diameters, shows the structure of electrolytic copper. The specimen was taken from a cathode plate. This radiating structure was not met with in any but electrolytic copper. Fig. 4, 475 diameters, is a longitudinal section of copper wire after drawing; it was made of lake copper. Fig. 5, 475 diameters, presents the structure of the wire shown in Fig. 4 after annealing. Fig. 7, 875 diameters, shows the structure of native copper coming from the Calumet & Hecla conglomerate. Fig. 9, 875 diameters, is a specimen of copper which has been melted in the air and kept in the liquid condition for some time; it is known as burned copper. The large white areas are the Cu_2O and the spotted and striped areas consist of the eutectic of copper and copper oxide. A very small amount of copper oxide can be detected under the microscope; just how small I have not been able to determine thus far, but hope to do so soon. Fig. 8, 875 diameters, shows the appearance of copper containing 0.31 per cent. of phosphorus. It consists, apparently, of an excess substance and eutectic. The further study of the microstructure of

*Case School of Applied Science, Cleveland, Ohio.

copper and copper alloys, as brought out by etching with ammonium persulphate is now being carried out in this laboratory.

The Mysore Gold Mine

SPECIAL CORRESPONDENCE

The report of the Mysore Gold Mining Company, of Mysore, India, for the year 1908 is again a record of prosperity. The mill crushed 206,170 tons of ore, from which gold to the value of £848,145 was recovered, or an average yield of 82s. per ton, just under 1 oz. fine gold per ton. The profit earned on revenue account was £458,285, out of which £350,055 was paid in dividends, equal to 115 per cent. on the nominal value (10s.) of the shares. The large difference between profits and dividend is due to the adoption of the policy of meeting expenditure required on capital account out of revenue and not by the issue of new shares. During the year under review about £79,000 was spent out of revenue on new buildings and machinery. For the last three years the operations of the company have been as follows:

	Tons Crushed.	Gold Realized.	Dividends.
1906	185,900	£809,413	£418,674
1907	194,838	820,114	409,071
1908	206,170	848,145	350,055

The mine superintendent gives a favorable report on the development of the mine. At the Ribblesdale section at a depth of 3900 ft. the reef has a width of 2 ft. 9 in., and a value of 28 dwt. At Tennant's section the reef at the deepest section (about 2500 ft.) is 5 ft. wide, assaying 58 dwt. In the southern end of the property, McTaggart's section, the developments are also good in the bottom. At the deepest point worked (2470 ft.) the lode was 6 ft. wide, assaying 24 dwt.

The ore reserves at the end of the year were estimated at 969,920 tons, excluding a quantity of low-grade ore, representing an ore supply sufficient for five years for the mills at the present increased rate of extraction. The average value of the ore reserves is not given. A new vertical shaft is to be sunk in the McTaggart's section to cut the lode at 1485 ft., which will correspond with the present 2460-ft. level. This shaft is badly needed for facilitating hoisting and for ventilation. Edgar's shaft, which has been sunk vertically 2628 ft., is expected to be equipped for hoisting by the end of the year. This shaft will command the lower workings of the Ribblesdale section and will be of great benefit to the general working of the mine.

The mill consists of 210 heads of stamps, the majority of which are in good running order. Having regard to the good grade of ore being met with at the deepest points reached, the prospects of the company may be said to be as satisfactory as at any period of its history. The mine may be regarded as the best in the Kolar goldfield.

Determination of Copper

John W. Root (*West. Chem. and Met.*, W. pp. 269-270) describes in detail the "hypo" method for the determination of copper. The method while not new, is not in as general use as it deserves. The analysis is conducted in the usual manner up to the point of the precipitation of the copper with zinc or aluminum. At this point the copper-sulphate solution is diluted with water to half fill a No. 4 beaker, a glass stirring rod inserted into the beaker, the beaker covered and its contents brought to a boil. A boiling solution of hypo (7 to 10 grams in 100 c.c. of water) is then cautiously added to the copper solution and the solution boiled hard from 15 to 30 minutes until clear.

The precipitate, which is more or less granular, is filtered through a No. 597 filter and washed well with hot water. The filter containing the precipitate is placed in a small porcelain cup, dried and ignited at a temperature just sufficient to burn off the free sulphur and consume the filter paper, gradually raising the heat until all the carbon is burned. The ignited residue is placed in a No. 3 beaker and the cup washed out with nitric acid by warming the nearly filled cup until any remaining oxide is dissolved. The acid in the cup is transferred to the beaker and the solution evaporated nearly to dryness and the determination finished by either the cyanide or iodide method.

The essential details are to have the copper-sulphate solution dilute and hot and to add the hot hypo solution carefully. Also the solution should be boiled hard till clear, the precipitate dried thoroughly before burning and the burning conducted at a temperature low enough to avoid fusing the native sulphur and yield a clean dry residue of copper oxide. This method insures a complete precipitation of the copper.

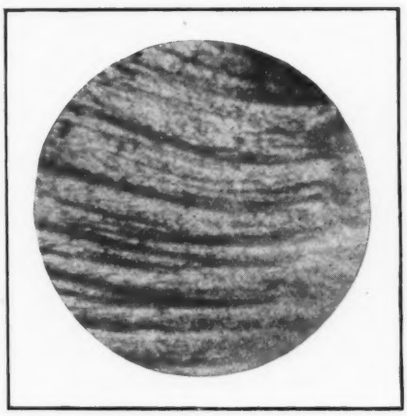


FIG. 7

FIG. 8

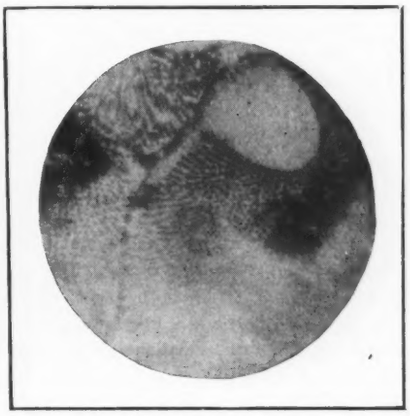


FIG. 9

The known tin deposits of Alaska that promise some future commercial importance are situated in the extreme western part of Seward peninsula. Adolf Knopf states that at present four localities are being prospected for tin. They are included within an area of 400 square miles, situated about 100 miles northwest of the city of Nome, the supply point of the region. In geographic order from north to south, these four localities are Ear mountain, Buck creek, Cape mountain and Lost river. The tin occurs in both placer and lode form. Up to the close of 1908 the total production of the entire region was 160 tons of cassiterite concentrates, all of which, except a few tons from lode deposits, came from the stream tin of Buck creek.

Manganese ore has been discovered in the Devil's peak (Table mountain), Cape Colony, according to the *Cape Times*, Feb. 27, 1909. The deposits are believed to be rich and cover an extent of about 1000 acres.

The development work in the Rand Mines during 1908 was 122,726 ft. (*Fourteenth Annual Report*). This includes all shafts, winzes, drift and crosscut work.

A Comparison of Coal-cutting Machines

With Statement of Costs, Showing Economy of Machine Mining and a Discussion of Compressed Air, as Compared with Electric Power

BY SYDNEY F. WALKER*

When I inquired into the working of coal-cutting machines in 1900, the disk machine, with very few exceptions, was favored by all colliery managers in the United Kingdom who had adopted coal-cutting at all. The punching machine had hardly obtained any footing; it had been tried at several collieries in the different coalfields and had been abandoned in nearly all of them; the reason being the jarring which the runners received when working this machine. On the other hand, I was told by a colliery manager in Scotland who had adopted the Harrison puncher machine for a short time, that some of his men got into the trick of handling them after a short time, and were able to do as well with them as the Americans who came over to act as instructors.

In America then and now, the puncher machine has always been a great favorite. On this side of the Atlantic, the puncher has made considerable progress, but as explained below, it is largely by altering its character, though there are signs that in its original form, it will have an increasing vogue. In 1900 the disk machine was preferred before all others, for longwall work, because it could be relied upon, with reasonable care and attention, to keep going, providing that power was supplied to it. If the power was there, a well made disk machine would go through almost anything. I have recorded more than once, where a disk machine electrically driven, has used 100 h.p. for a short time, while 50 h.p. for a limited interval was fairly common. The important thing was, the machine would keep on working.

In one case which came under my notice, several machines had been continuously at work for five years, at the face in a colliery in Yorkshire. At that time, in 1900, the bar machine, though it was older in its inception than the disk machine, and was much liked, was not largely used, because it was somewhat unreliable. The gearing was liable to become much worn, the motor driving the machine was apt to vary its speed considerable, according to the different substances the bar was cutting through, and there were other troubles. Since then, most of these troubles have been overcome, and the bar machine may now be said to be a thoroughly practical apparatus, and to take its place in the contest with other machines, on strictly commercial lines.

At the present time, there are several makers of bar machines, where there was only one in 1900, and there are two forms of this machine as described below.

The Jib Machine

In 1900, the jib machine, which had been introduced much earlier by Archibald Baird & Company, of Scotland, and by Winstanley in Lancashire, had been abandoned. At the present time the jib machine has been resuscitated, but in a different, and in a more practical form The present jib machine is really a modification of the chain-heading machine that has been upon the market for a long time, and that is so largely used in the "pillar-and-stall" system employed in American coal mines; this machine has also had a large vogue in the United Kingdom for driving headings.

In the present jib machine which is made by several firms, the chain with its cutters, runs around a frame, just as in the heading machine, but the frame is held between two narrow plates, which project under the coal, just as the disk does. The chain carries pick shaped cutters and does the same work as the disk machine but in rather a different manner.

The operation of the four machines mentioned, the puncher, the disk, the bar and the chain, are distinctly different though all are aiming at the same result, to imitate the work of holing done by hand labor in the past, and if possible to improve it. The puncher machine in the original form, consisting of the drill with its air cylinder behind it, carried on a pair of wheels, appears to answer more nearly to the work of hand holing than any of the others. Strictly speaking, the puncher is a pick, with a power machine behind it, wielded by the runner, and it has nearly all the flexibility of the hand pick.

Whenever a machine is arranged to take the place of hand labor, the machine is always at the disadvantage that it has not the flexibility of hand work. In the case of holing under the coal for instance, the skilled miner could work around balls of pyrites, and could literally pick his way, on the line of least resistance. The puncher machine arranged with its wheel carriage, is able to closely follow this. On the other hand, the bar and the disk and the chain, all have to cut more or less uniformly, and more or less blindly. There is no flexibility about them, except as will be described below. The action of these three again is different.

The cutting tools of the disk machine remove the dirt, or the coal, whichever they may be cutting in, by scraping. It is more or less the action of a carpenter's chisel. The bar machine with its reciprocating and rotary motion, claims that its action is that of the pick, but the work is divided up among a large number of very small picks. In the chain machine it is claimed by the makers, that the action of the cutting tool is closely similar to that of the pick, and the material brought out by the cutters, bears this out to a large extent in a great many instances. With the disk and bar machines, the holing dirt is usually dust, with the chain-jib machine the holing substance is brought out in small lumps.

Merits of the Different Machines

The bar machine has claimed an advantage over the disk, that in case of the coal settling down upon the machine, the friction is nothing like as great, and the bar could go on working, while the disk might have to be stopped; this is evidently correct. Both the bar and the chain machines have the great advantage that the coal can be spragged right up to within a few inches of the cutting tool itself, while in the case of the disk the spragging of course, has to be some distance behind the disk itself. Further, the chain machine appears to have a distinct advantage, in the fact that the plates between which the rollers upon which the chain-runs are held, does not move in the same sense as the disk moves. It moves on as the machine moves, and as the cut moves, but it is not in continual motion like the disk is, and therefore the friction is considerably reduced. This is borne out in practice by the fact that the chain machine works with approximately half the power of the disk machine for any given work.

The bar machine also works with considerably less power than the disk machine, and approximately the power for chain and bar machines for the same work, are about equal. By the same work

*Consulting engineer, Bloomfield Crescent, Bath, England.

is meant, cutting in the same material, and to the same depth. It is understood of course that the power required for cutting in different materials, is different. The smallest power required is for cutting in soft kinds of coal, the largest for cutting in hard fireclay. Both the bar and the chain machines also have the advantage, which is now a thoroughly practical one, in the machine on the market, that they are able to avoid obstacles, such as the nodules of pyrites that are the *bete noir* of the coal-cutting machine. Both the bar and the chain are arranged to be inclined upward or downward, so as to avoid any piece of hard substance, and that without interfering with the general arrangement of the machine platform.

All three forms, the bar, the chain, and the disk, are now arranged to cut at practically any level that is met with in a coal pit, and all of them are made practically for any thickness of seam. All of them also are made to run on wheels resting upon rails, that are laid in front of the coal face, or on skids, which make their own floor. The skids were originally introduced by the makers of the chain machines, but the makers of disk and bar machines quickly followed suit.

A New Form of Bar Machine

A form of the bar machine that is somewhat different from the remainder of those on the market but which is really an older form of machine resuscitated, is that known as the Simplex. It is the Goolden machine, which was introduced some 20 years ago, into several of the English coalfields, with important modifications. All gearing has been suppressed. In the other bar machines, the bar receives motion from the armature shaft, or the crank shaft of the engine through a somewhat complicated arrangement of gearing which provides the necessary reduction of speed, and also the reciprocating motion, and the ability to work around obstacles mentioned above. In the Simplex machine, which is also noteworthy for the fact that it has been developed by colliery engineers, at the Walsall Wood colliery in Staffordshire, the bar is directly attached to the axle of the motor, the motor itself being fixed in the center of the machine.

The bar itself also is slightly different from that employed with the other bar machines, of which the Hurd is the type. In the Hurd, the Picquick, and similar machines, the bar is either conical or cylindrical, the smaller end of the bar, when tapered, being on the inner end of the cut, and the bar has a screw thread cut in it, the cutting picks being sometimes fixed in the bottom of the thread, and sometimes on the top of the thread. The object of the groove is to act as an Archimedean screw to bring the dirt out. In the Simplex machine the bar is square, but tapered, the cutting picks being fixed on the square faces, and arranged to be quickly tapped in and tapped out.

Disk Machine Still the Favorite

In spite of all the improvements in the bar machine, and the advent of the chain machine, the disk machine is still leading. According to the Home Office Reports for 1905, the number of disk machines in use still exceeded those of the whole of the remaining types of machines together, but there are signs that the proportion is being reduced. The disk machine is still liked by a large number of mining engineers, on account of its greater strength, and its greater ability to deal with any class of work. On the other hand, its greater weight, in the case of the majority of disk machines, is against it, because of the time and labor taken in "flitting" after a cut. Some forms of disk machine, however, in particular the Diamond, are arranged to cut to and fro across the face, and therefore it is only a question of filling out the coal that has been brought down from the previous cut, and where as in many collieries, the coal is cut at night, and filled out during the following day, the disk machine working to and fro, answers very well.

It will be understood that the above remarks refer to "longwall" working, which is so largely employed in collieries in the United Kingdom. A great deal of good work is being done by heading machines, as mentioned below. Exceptions to the heavy weight of the disk machines, are the Gillott machines, the oldest disk machine in this country, practically the parent of disk machines, which weighs only from 15 cwt. to a ton, and the Jeffrey, an American machine, which weighs 30 cwt. The majority of the disk machines weigh 2 tons.

The Puncher *vs.* Disk, Bar and Chain Machines.

As mentioned above, the punching machine has received a new development in the last 7 years. The development commenced with a machine worked out in Germany, known there as the "Eisenbeis." It was brought over to the United Kingdom and known as the "Champion," and is now known as the "Siskol." It has been followed by several others, the "Radialax," made by the Ingersoll Rand Company, the "Little Hardy" made by the Hardy Patent Pick Company, and others. The essential feature of these machines is, the drill is held upon a vertical pillar, consisting usually of a tube, arranged to be extended, or shortened, and fixed between blocks on the floor and the roof.

The connection between the body of the machine and the support, is practically a universal joint, and the drill is arranged to sweep over an arc, either in a horizontal, or vertical plane, or in any plane at any angle that may be desired. The method of working is, a drill of a certain length is placed in the machine, and is made to sweep out an arc, in the plane in which it is set, cutting a groove in the coal, or whatever the substance may be, to the depth the drill is capable of working. The drill is then removed, and a longer one placed in the machine, which cuts the groove deeper, and so on.

It will be seen that this arrangement allows of grooves to be cut in any position, and under practically any conditions. When the groove has been cut to the required depth in one position of the drill, the pillar is taken down, moved forward along the face, a fresh cut made, and by properly overlapping the arcs, a practically continuous cut is obtained. Some forms of this machine are not able to work in thin seams. It will be seen that while a considerable amount of work may be done with this form of apparatus, it has not the flexibility of the puncher on wheels. It does not represent so closely the man behind the pick. It has more of the limitations of the machine.

A later development of this arrangement, which has been adopted in the county of Durham, is, the machine is mounted on a carriage fixed horizontally, the machine standing horizontally, and cutting its arc from that position. The carriage has wheels which run on the usual mine rails.

The smaller types of these machines are useful to assist the disk machine. For instance, in room work, where a disk machine is working across a fairly long room, something on the lines of the system adopted in America, the little punching machine is handy to cut a vertical "nick" after the undercut has been made, to assist in getting the coal down. The power taken by the puncher in its original form on wheels, with the runner spragging the wheels with a shoe on his boot, is practically the same for the same work, as that of the machine carried on the vertical pillar, or on the horizontal carriage.

There is the same variation in the power expended, with both of these machines, according to the substance in which cutting is being done, but both require from 70 to 100 cu.ft. of air per min. at 60 lb. pressure. The puncher machine, and in particular the one on wheels, has the advantage, which is being more realized as coal cutting is being more and more employed, that the coal undercut by it comes down better than

when undercut by any of the other three. The coal undercut by the tapered bar, also is found to come down better than that cut by the chain or disk. The working, as in other cases, depends upon the kind of coal that is cut, but there are complaints that with the ordinary parallel cut, and particularly with a small thickness of cut, the coal, where the joint with the roof is not strong, simply settles down upon the floor, when it is free to do so, in one mass, and has to be broken up by shot firing, before it can be filled out. On the other hand, with the cut made by the puncher, which can be arranged in any form the runner likes, and which is usually more or less of a V shape, or the section of a right-angled triangle, the coal is able to fall forward cleanly, just as when hand holed, and it breaks up much better with the parallel groove. With the V-groove made by the tapered bar, which may be as much as 7½ in. at the front, against 3½ in. at the back, the coal has again a better chance of breaking clear from the roof, and of breaking up. It is stated that a higher price has to be paid to fillers for filling out coal after parallel cuts, than after the cuts made by the puncher.

It should be mentioned that so far, all punching machines are worked by compressed air. No electric puncher has yet established itself, though there have been several tried.

[An electric coal puncher manufactured in this country at Syracuse, New York, is being satisfactorily used at a number of American mines.—EDITOR.]

CUTTING IN THE COAL IS TO BE FAVORED

A point also may be mentioned in connection with the question of cutting in the coal and cutting in the underlying fireclay. Cutting in the floor enables the whole of the coal to be obtained, but it is claimed by Mr. Mavor, a member of the firm who are makers of one form of the bar machine, that by cutting in the coal, a larger quantity is undercut in a given time, and for a given amount of power, and the quantity of coal got in the specified time is therefore larger, and though the quantity of small made is also greater, the final balance is in favor of cutting in the coal.

It may be mentioned, that in the controversy between the makers of bar machines and the manufacturers of disk machines, apparently bar-machine makers prefer to cut in softer material, while disk machine makers do not mind what the material is.

COST OF GETTING COAL

The cost of getting coal by the disk machine, which varies necessarily with the material cut in, and with the other conditions, ranges from 26c. per ton to $1.10, the latter being an exceptional price, 40 to 62c. being the general range. The saving with coal-cutting machines over hand labor, ranges from 2c. per ton up to 39c. per ton. In the majority of cases, the savings are from 8 to 16c. per ton. The question of compressed air and electricity is dealt with farther on, but it may be mentioned here, that there does not appear to be any great difference between the costs when driving by compressed air and by electricity, under similar conditions. Further, the costs as obtained by impartial observers, appear to show that the disk machine is still the one working at the smallest cost all told, though again, with the same conditions, there does not appear to be any great difference.

The question of the actual machine to be employed depends entirely, as in so many other engineering questions upon the whole of the conditions present. As explained above, where the work to be done is heavy, it is at least wiser to use a disk machine, notwithstanding the disadvantages mentioned, while where the holing is light, one of the other machines may be employed with advantage.

One important advantage that arises incidentally from the use of coal-cutting machines, is the increased output per man employed. In the United Kingdom, with the increasing output of coal, the number of skilled men available is becoming proportionately less, and therefore any increase in the output per man is of value, both from this cause, and also because it lessens the outlay that has so often to be undertaken in providing houses for the miners.

Collieries are usually located where houses are not easily obtainable. Most frequently what are practically new villages have to be built, to accommodate the men working at the colliery, and the outlay under this head is often a considerable item in the capital account. Coal owners and coal mining companies find it absolutely necessary to provide houses, and of an increasingly comfortable class, for the working miners, or they cannot get them to come to the colliery; hence, anything which reduces this item of outlay, is of importance.

DRIVING HEADINGS

In driving headings, the struggle is between the well known chain header, represented in this country principally by the Jeffrey, and the puncher represented by the Ingersoll-Rand machine on wheels, and the different forms that have been mentioned, in which the machine is carried on a vertical pillar, or horizontal carriage. Apparently the chain header is holding its own, but the struggle is fairly keen, and in particular a large number of the "Champion" or "Siskol" machine, as it is now called, are being employed for the work. The great portability of the machine is of enormous advantage in driving headings, and in all narrow work, such as the "bord-and-pillar" working, of which there is still a considerable amount going on in the United Kingdom.

COMPRESSED AIR *vs.* ELECTRICITY

In 1900, by far the largest number of coal-cutting machines in use in the United Kingdom, were driven by compressed air, the proportion between those driven by compressed air and by electricity, being nearly as 5 to 1. But with the development of the use of electricity that has been going on so rapidly since then, the number of electrically driven machines has been steadily increasing. The number of coal-cutting machines in use has increased from 316 in 1900, to 1133 in 1906, but the machines that have been brought into use since 1900, have been, a large number of them, electrically driven. In 1906 the proportion was 682 run by compressed air, and 451 by electricity. If the work the different machines are capable of doing is taken into consideration, the proportion would now be largely in favor of electricity, for among the machines run by compressed air, are a large number of the punchers of the "Champion" and similar types. Recently, however, there has been a revulsion on the part of colliery managers, against electric driving of coal-cutting machines, principally because of the greater danger to life. Electrical apparatus in mines, in the United Kingdom, has unfortunately taken a somewhat large toll of life, and the toll has been particularly heavy in electrically driven coal-cutting machines.

The following instance, which was the subject of an inquiry in Scotland, illustrates this point: The flexible cable connecting the gate-end switch box with the coal-cutting machine, was inclosed, in the neighborhood of the machine, in an india-rubber tube; the tube passed through the hole in the frame of the machine, through which the cable was carried, and formed the protection for the cable, against the cutting action of the metal in the hole. The rubber tube was cut or worn through, and in time the conductor became connected with the frame of the machine, and the man who was engaged in moving the haulage rope in front of the machine, received a shock, which killed him. Apart from the humanitarian question, it is certain that no colliery manager would allow the use of machines, unless a reasonable chance of safety to the attendants was assured; with the "Workman's Compensation Act" in force, the killing of a man makes

rather a serious charge upon the cost of getting the coal. A man's relatives may have as much as $1500 awarded them as compensation for his death, and it will be seen that this makes a charge of about 12c. per ton upon 12,000 tons of coal. From the figures given in a previous portion of the article, for the saving in cost obtained by the use of coal-cutting machines, it is evident that something like one such accident a year would neutralize in many cases, the whole of the saving obtained by the use of the machine.

Why Electricity is Favored

The principal reason why electricity has been so largely introduced into mining work, for power purposes, and hence has been adopted for coal-cutting machines, is the greater efficiency of transmission. It is practically acknowledged that when air is compressed at the mine, an efficiency of only 25 per cent. or at most, 30 per cent. in transmission to the face, can be hoped for, while with electrical transmission, 50 per cent. can nearly always be relied upon, and 60 per cent. can often be obtained. But while this argument has an important bearing upon the question of the power used underground in a colliery as a whole, and particularly in the collieries of the United Kingdom, where the distance over which the mineral has to be hauled, and the quantities to be hauled, the water to be pumped, etc., are so steadily on the increase, the argument is by no means so sound, when applied to coal-cutting machines. Of the total cost of getting coal by means of coal-cutting machines, the cost of the power is not such an important item. I have before me, figures taken from actual work, with different types of machines, in different kinds of coal. The amount of energy expended per ton of coal obtained, ranges from 0.25 of a "Board of Trade" electrical unit, or kilowatt-hour, up to 1 kilowatt-hour. The cost of generating electricity at a colliery, is in the case of the latest modern installation, less than 1c. per unit, and in even small installations, not laid out so economically as those that have been mentioned, the cost per unit will not exceed 2c. In my opinion, 2c. per unit would be a high price.

Two-stage air-compressing machinery of the straight line type, driven by compound engines, is at least as efficient as electric generating machinery. It is a question whether it is not more efficient, if the question of the heat in the air is omitted. Hence, allowing that the efficiency of electrical transmission is twice that of compressed-air transmission, when the latter is compressed at the mine, the costs for power would range from ½c. per ton, up to 4c. per ton, the latter being usually in cases where the total cost of getting the coal is high, owing to the general conditions. It will be seen at once, that the question of the saving in the cost of power, so far as coal cutting is concerned, is not really serious, and that as a question of economy, electricity does not prevent any great advantages over compressed air, in a great number of cases.

But there is another and very serious aspect of the question, and that is the difficulty that is so often experienced in maintaining the necessary power at the face, with compressed air. The efficiency of transmission by compressed air, as is well known, is largely reduced by leakage. The sides and roof of mines unfortunately work, and the joints in the compressed-air pipes are apt to be sprung, resulting in the leakage of the air, which is an important item. Further, in the case of coal-cutting machinery, the flexible hose which connects the air-pipe service with the coal-cutting machine, is liable to be damaged.

One colliery owner who had adopted an electrically driven coal-cutting machine, informed me that he was led to do so because when inspecting different coal-cutting machines at work, he had seen more than one in which the hose had been damaged, and the air was coming away freely at the face, instead of working the machine. This is one of the troubles that there should be no difficulty in overcoming, and I believe it has been overcome by the use of flexible metallic tubes; however, it illustrates forcibly the weak point of driving coal-cutting machinery by compressed air. Again and again in the reports of tests that have been made, the remark occurs, the pressure of the air at the machine was not greater than such and such a figure, and therefore the machine could not do its best work.

The Difficulty of Maintaining Pressure at Face

The above applies quite forcibly to the case of the puncher machine. To perform its best work, whether on wheels or supported on a pillar, it requires a pressure at the machine, of not less than 60 lb. per sq.in., and it is difficult to maintain this pressure when the air is compressed at bank. It is necessary to compress to a very much higher pressure than is usual, and therefore the efficiency of the system is lowered, and notwithstanding the higher pressure at bank, it is still difficult, partly owing to the higher pressure, to maintain the necessary pressure at the face.

The development of electrical power in coal mines provides the solution of the problem. In Germany, a good many years ago, the system was introduced of placing the air compressor as near the working face as possible, and driving it by an electric motor, taking power from the electric service of the colliery. At first sight, as in so many other cases, it looks as if the arrangement could not be economical. The energy of the steam engine has to be converted to electrical energy, to be transmitted through cables, which take their toll, to be converted to mechanical energy in the motor, and then the compressor has to be driven.

A consideration of the whole theory of the working of compressed air in coal mines will show that notwithstanding the double conversion, the arrangement is economical, and practical experience confirms this. It is perfectly practicable to compress air, in the neighborhood of the coal face, to such a pressure that it can be delivered at the coal-cutting machine with practical certainty at 60 lb., and the coal-cutting machines are thereby enabled to do their best work. It will be remembered that apart from the leakage of air that has been mentioned, the great source of loss with transmission of power by compressed air is the fact that the heat which is liberated in the air during the act of compression, is obliged to be wasted. It would be lost in any case during the passage of the air from the surface to the coal face, and in practice it is found more efficient to, as far as possible, carry off the heat from the air as it is liberated. The reason for this is, of course, that larger quantities of free air are taken in at each stroke of the piston, when the air is cooled and the compressor itself is cooled, than when both are allowed to heat and expand.

Preventing the Freezing of the Moisture

But with the conditions ruling at the face the problem is a different one. One of the troubles in connection with the running of compressed air engines at the face, it will be remembered, is the freezing of the moisture carried by the air, in the ports of the engine, and the consequent throttling of the air, resulting in reduced efficiency and reduced output of the engine employing it. This has been overcome by the improved arrangements that have been introduced during the last 15 years or so. Where the air is compressed in the neighborhood of the face, it has been suggested by makers of compressed-air machinery, notably by Mr. Reavell, who has developed the electrically driven portable air compressor, for use at the face, that the air need not be cooled; that it should be delivered to the engine that is to use it as nearly as possible at the temperature to which it is raised in compression. Mr. Reavell has succeeded, by insulating the pipe lead-

ing from the compressor to the motor engine, in delivering the air at such a temperature that the exhaust air from the engine is still hot, and there is no tendency whatever towards freezing, etc. Mr. Reavell suggests that the matter might be carried further than this. It is well known that with compressed air the lower the pressure the higher the efficiency, and he therefore suggests that the air shall be compressed to only 20 lb. or thereabouts, adiabatically, and delivered to the motor engine, with, as far as possible, all the heat present that has been delivered to it.

He further suggests that the motor engine might be arranged to work expansively, and that by employing a slightly higher pressure, say 22½ lb. instead of 20 lb. per sq.in., and cutting off at 0.6 of the stroke, instead of 0.9, as usually arranged, a considerable economy in air and in power would result.

Mr. Reavell informed me that he has not yet had an opportunity of carrying out this plan, but he has succeeded in delivering the air hot to the motor engine, as explained. It appears to the writer that the matter may be carried still farther, and that the plan adopted by the Ingersoll-Rand Company for one of their drills might be adopted for coal-cutting machines with advantage, and the air kept continuously in circulation from the compressor to the motor engine and back to the compressor again. This would get rid of all possible troubles from moisture, such as might arise when the air of the mine from which the suction for the compressor was taken was muggy, as occurs at certain times of the year.

There should be no difficulty also in arranging to thermally insulate the pipes leading from the compressor to the coal-cutting machine, and back to the compressor. There are a number of substances on the market, that could easily be applied to the outside of metallic tubing, and that would maintain the temperature of the air, with very little loss between the compressor and the coal-cutting machine.

It should be possible also, with such an arrangement, if it is worth doing, for the sake of economy, to work the engines driving the coal-cutting machines more expansively. Obviously it would be to the advantage of the whole system to expand the air to as low a pressure as possible. The arrangement in fact would be a counterpart of that which is done with cold-storage compressed air apparatus.

Concerning the question of working the punching machines at lower pressures, if the suggestion to work at lower pressures is worth considering on the ground of economy, there should be no difficulty in meeting. It would merely mean a small increase in the areas of the cylinders.

It should be mentioned also, that the compressed-air motors driving coal-cutting machines have also been very much improved during recent years. The motors employed for the early coal-cutting machines had one cylinder only, then two cylinders were employed, and two cylinders were the universal practice until very recently. Now four cylinders are employed, giving a much more even turning moment to the crank shaft, and providing a more efficient machine.

Quebec Mining Law

SPECIAL CORRESPONDENCE

Some important changes in the mining laws of Quebec province have been made by a bill introduced by Hon. Charles Devlin, Minister of Colonization, Mines and Fisheries, which was passed by the provincial legislature on May 8. It assimilates the law as regards prospecting and the acquisition of mining claims to that of Ontario. The former "prospecting license" is abolished, but the rights of present holders of prospecting licenses will be continued until Jan. 1, 1910. It will be replaced by the issue of miners' certificates, which can be obtained on payment of a fee of $10, and confer the right to prospect on all lands, whether public or private, the mining rights on which are vested in the Crown. In case of discovery the prospector must erect a discovery post on the chief point and four corner posts inclosing his claim. In unsurveyed territory the area of a location cannot be less than 40 nor more than 200 acres, while in surveyed territory a license may be granted for one acre and upward to 200 acres, which is the limit in both cases. After staking, the Mines Department is to be notified at once, and within four months from the date inscribed on the posts application must be made for the issue of a mining license. The application must be accompanied by a fee of $10 in addition to a sum equal to $1 per acre of the location. The mining license is good for one year and can be renewed on payment of the same fee and acreage tax. The mine can be worked for any length of time on this license.

Mining land can be purchased, as before, at any time on payment of the price, $10 per acre for superior minerals and $2 for inferior minerals, if at a distance of 20 miles from a railway; and $20 per acre for superior minerals and $4 for inferior minerals, if situated less than 20 miles from a railway. All sales are on condition that *bona fide* working of the mine is to commence within two years and the patent is to issue only after an expenditure of $500 for each acre purchased has been made. Failing these conditions the sale may be set aside.

This act is intended to remove the great objection to the old law that tracts of mineral land could be purchased and held indefinitely by speculators who had no intention of working them. Its enactment has been urged for several years by J. Obalski, long head of the provincial Bureau of Mines.

Oil and Gypsum Locations in California

SPECIAL CORRESPONDENCE

There is some excitement at Watsonville, Santa Cruz county, Cal., over the discovery 12 miles distant, of an oil well yielding 250 bbl. daily and plenty of natural gas. Santa Barbara men are about to commence drilling for oil on 1700 acres of bonded land south of Red Bluff in Tehama county. This is far north of any point where oil has thus far been found in the State. Another item of interest in the oilfields is the discovery of auriferous sand at a depth of 300 ft. in the McKittrick oil district, Kern county.

Recently large areas of land in the known oil belts have been located for gypsum, though it has been an open secret that oil was what was wanted. An agent of the Land Office has been looking into this matter and where patents were about to issue to gypsum locators, they have been notified that receipts have been issued under a misapprenhension of facts. They are also informed that the gypsum to be mined must have a commercial value, and in this value accessibility must be considered. If at a point remote from a railroad where the cost of mining and hauling would preclude the possibility of selling at a profit, its commercial value would be nullified. The miners do not take kindly to the Land Office determining both mining and commercial possibilities for them when passing on mining locations. The miners think they know more about this than the Land Office.

Consul Henry D. Baker reports that in the silver-lead mining district of Western Tasmania there was considerable embarrassment during 1908 on account of the closing of the smelter at Zeehan, owing to lack of profit in successfully treating complex ores, with low prices ruling for the products extracted. Owing to the distress occasioned by the closing of the smelter, the Government loaned the company money with which it could resume occupation.

A Volumetric Method for the Determination of Mercury

By W. H. Seamon*

The following method has been well tried out in my laboratory, first on salts of mercury mixed with varying amounts of the salts of such other substances as might interfere with, or influence, the reactions; and finally with ores of mercury carrying cinnabar with a lime, iron, silicious and clayey gangue. The method is based upon the formation of mercuric iodide when potassium iodide is added to feebly acid solutions of mercurial salts, the end reaction being determined by the formation of the characteristic blue color made by iodides in the presence of small amounts of nitrous acid in contact with starch paste.

Scheme

Weigh out half a gram of the pulp and transfer to an Erlenmeyer flask of 125 c.c. capacity; add 5 c.c. of concentrated hydrochloric acid and allow it to act for 5 to 10 min. at a temperature of about 40 deg. C. Then add 3 c.c. of concentrated nitric acid and resume the gentle heat until all the cinnabar is decomposed, which will occur in a few minutes. Then add 3 c.c. of strong sulphuric acid to precipitate lead salts, if present, after which 5 c.c. of strong ammonia is added with care, drop by drop, followed with 25 c.c. of water. Filter, collecting the filtrate in a 150-c.c. beaker, washing the filter carefully twice and keeping the bulk of the filtrate as low as possible; then add 2 c.c. of strong nitric acid which has been discolored by exposure to strong light and cool to room temperature. The solution is then ready for titration.

Standardization

The standardizing solution is made by dissolving 8.3 grams of potassium iodide in a liter of water. A solution of this strength will have a value of 0.005 gram of mercury to each cubic centimeter. It is standardized with solutions of mercuric chloride. The usual solution of starch paste, cooled to room temperature, is kept ready for use and small drops of it are placed on a color plate. The titration is made by setting aside one-third of the solution and running in the standard solution from a burette, withdrawing a drop of the solution from time to time, until a strong end reaction is obtained; then add the reserved portion and continue until a faint blue coloration is found. Deduct ½ c.c. from the burette readings when the bulk of the liquid is over 50 c.c., unless the standardizing is done with varying amounts of mercuric chloride, corresponding to the percentages of mercury in the ore.

*Apartado 247, Chihuahua, Mex.

Accuracy

In the trials I have made I have found the results on the same ore to check within one-tenth of 1 per cent. and have worked with ores carrying from 1 to 15 per cent. of metallic mercury. Working on weighed amounts of mercuric chloride, treating them as described above for ores, I have found the method accurate for weights of mercuric chloride ranging from 0.005 to 0.35 gram.

In titrating, the characteristic precipitate of mercuric chloride will not show under the conditions described unless there is about 4 per cent. mercury present and in some instances, when larger quantities of acids, etc., may have to be used, the precipitate may not show, even though there be 15 per cent. mercury present. Although the absence of a precipitate may be regarded as unsatisfactory, yet the accuracy of the method is not affected, for the double decomposition of the two salts goes on just the same and the end reaction will not show until the proper amount of iodide of potassium is added.

Effect of Free Chlorine

The presence of free chlorine destroys the accuracy of the method, giving the end reaction on the addition of the first amount of iodide of potassium. To overcome this difficulty, free chlorine being generated by the mixture of the hydrochloric and nitric acids, was the occasion of much labor. Evaporation of the first solution on the water bath is the surest way of driving off the chlorine, as well as the excess of acids, and makes the method more accurate and the formation of the precipitate more certain at the time of titration; but this requires more time than is always convenient in a technical laboratory. Boiling the solution, before the addition of ammonia, was tried, using a larger amount of sulphuric than directed; also adding more water; but in all trials made it was found that enough chloride of mercury was volatilized to sensibly lower the results. It was finally found necessary to keep the amount of acids used in decomposition to as low a point as possible and to add the ammonia as described. The presence of ammoniacal salts hinders the formation of the precipitate of mercuric iodide; otherwise they have no effect.

Decomposition of the Ore

The decomposition of cinnabar is not easy and it is best to have the pulps as fine as 200 mesh, and the hydrochloric acid should be allowed to act for a few minutes alone before adding the nitric acid; failure to adhere to these instructions will cause a failure in solution.

The following method of decomposition gave satisfactory results, but was not adopted owing to the frequent breakage of the flasks: The weighed pulp was introduced into a pear-shaped flask of 200 c.c. capacity, to which was added 7 to 10 c.c. of concentrated sulphuric acid, ½ gram of crystallized tartaric acid and 7 grams of acid sulphate of potassium. The flask was heated in a gas flame, or that from a Dangler lamp, until the solution became almost colorless; then 5 grams of potassium nitrate was added and heating continued until all, or nearly all, of the sulphuric acid was driven off. The flask and contents were allowed to cool and the mass dissolved in water, with the aid of heat, the solution filtered, 2 c.c. of brown nitric acid added, the solution cooled and then titrated. In the trials made and completed, the results were found to be good and the method more satisfactory than the one adopted. There were so many losses from breakage of the flasks that it was abandoned. No loss by volatilization occurred.

Presence of other Compounds

Small amounts of nitrous acid are necessary to give the end reaction, setting free the iodine. I have found 2 c.c. of nitric acid, which had been exposed to the sun long enough to be discolored, sufficient. Soluble salts of lead are precipitated by potassium iodide, consequently they must be removed. If known to be absent the addition of sulphuric acid may, and should, be omitted. I added weighed amounts of lead nitrate to the pulps used and found that the method described eliminated all the lead far enough not to affect the results when as much as 0.2 gram of lead nitrate was employed. The soluble salts of silver are also precipitated by iodide of potassium. No special tests were made to determine if the hydrochloric acid employed eliminated it sufficiently to prevent interference.

One-tenth of a gram of a salt of iron, copper, antimony, arsenic and bismuth were added separately to a pulp and it was found that their presence did not change the results.

Comparison of Wet and Dry Method and Conclusions

Five different pulps were employed and the results obtained by the dry and iodide methods were as follows, the first figures being the percentage found by the dry method, and those in parentheses the percentages found by the iodide method: (1) 0.8, 1.1, 0.9 (1.2, 1.1, 1.2); (2) 3.5, 3.0, 3.4, 2.9 (3.6, 3.5); (3) 7.5, 8.1, 7.0 (8.3, 8.2, 8.4); (4) 10.5, 9.0, 10.3, 10.0 (11.7, 11.6, 11.6, 11.7); (5) 12.5, 11.2, 13.8 (15.1, 15.0, 14.9).

The method is quick and reliable. The treatment with sulphuric acid can usually be omitted, as lead is seldom found associated with mercurial ores, so far at least as my own experience may be relied upon. Care must be employed to use as little acid as possible to secure perfect decomposition, and to eliminate free chlorine and the presence of hypochlorites; in efforts to accomplish this do not

fail to remember that mercuric chloride is volatilized on boiling, freely, solutions of mercurial salts in the presence of free hydrochloric acid.

Efficiency in the Administration of of the Public Lands of a Nation*

By A. C. Veatch†

Van Dieman's Land was once chiefly remarkable as the site of a most notorious British convict settlement. Today this country, renamed Tasmania, furnishes a most inspiring record of efficient public service. Viewed from our own sad experience the record there is almost incredible and is both an incentive and a promise.

Gold was discovered in Tasmania in 1852 and the mineral wealth of the country began to be slowly developed. In 1871 the future of Tasmania as a great mining region was assured, and a great vista of promise opened up by the discovery of the now famous Mt. Bischoff tin mine, which up to the close of 1906 had paid dividends to the amount of £2,083,000. Other discoveries followed, principal among which were the rich silver mines at Zeehan, discovered in 1882, and the famous Mt. Lyell copper-gold mine, found in 1886. This mine in the year 1904 paid dividends to the amount of £150,000; in 1905, £175,000; and in 1906, £420,000.

Disposal of Mineral Lands

All these mines were discovered at a time when there was absolutely no law forbidding the sale of mineral lands. Whether they were sold or leased was entirely a matter of executive discretion, and yet so faithfully have the land officials discharged the trust imposed on them that not only are all these important mineral properties still owned by the State, but except for small areas of coal lands, alienated in the early history of the colony, no mineral deposits of importance have passed into the hands of private owners. So insignificant are the coal areas that the only coal mines in this territory which are now being worked are operated on Government lease. Indeed, the total mineral production of Tasmania today, and in 1905 it equaled that of Nevada, comes from Government leasehold. These results contrast very markedly with those obtained in the United States. Here, while the law of July 4, 1866, expressly forbids the alienation of mineral lands under the agricultural land laws, enormous areas of such lands have been acquired in this way.

So far did the Tasmanian officials deem it advisable to carry this policy of reservation from sale of lands known or supposed to contain minerals, that it became necessary to provide some form of surface holding within the mining areas. The Waste Lands Amendment Act of 1881, therefore, provided for the sale of lands in mining settlements subject to the right to mine on payment of damages. The act of 1885 gave to the holders of business and residence areas the right to purchase the same after an expenditure of a certain sum on improvements, but in all cases with the reservation of the right to mine at a depth of not less than 50 ft. The act of 1889 went a step farther and declared all lands in mining areas open to selection but with the reservation of the right to search for gold and the right to mine at depths of not less than 50 ft. In 1891 the depth was reduced to 20 ft. and in 1900 the reservation included the right to search and mine for gold and other minerals. The Crown Lands Act of 1903 marks the natural conclusion of these several steps by providing that thereafter all grants should contain a reservation of the right to mine for all minerals at a depth of not less than 50 ft. on payment of damages. The Lands Act Amendment of 1905 waived all question of depth and provided for the reservation of all minerals in all grants.

Leasehold vs. Freehold

The Tasmanians regard the policy of government leasehold not as primarily a method of obtaining a direct revenue, but as the best way of securing the proper development of the mineral wealth and resulting increase in the population and ordinary tax revenue of the State. There is no theoretical consideration that the State should control all things. There is only the practical consideration that certain things should be done because the best results can be attained in that way. Had leasehold proved unsatisfactory, or if freehold were shown to be the best way of promoting the attainment of the desired result, there is no question that the mineral lands would have been and would now be sold, but there is among mining men in Tasmania the same abiding feeling of satisfaction with the general principle of mineral leasehold that is found throughout Australia.

In response to the question, "What are the defects in the present law from the standpoint of the prospector and capitalist?" the Secretary for Mines replies: "No complaints from either prospectors or capitalists have been received; I presume they are satisfied." In answer to the question: "Does the policy of leasehold retard mineral development, as compared with freehold?" the Secretary replies with the unqualified monosyllable "No!" Lindsay Tulloch, a director of the Mount Lyell mine, the richest man in Tasmania, states most positively that he considers leasehold a better method of promoting development than freehold. Col. F. C. Hughes, vice-president of the Victorian Chamber of Mines, and a mining man interested in properties all over Australia, including several in Tasmania, states that the mining men of Australia with practical unanimity indorse leasehold as a better method of promoting mining development than freehold, and in his wide acquaintance among mining men, he knows of but one who seriously advocates freehold.

Tasmania thus affords not only a convincing indorsement of the practical success of government leasehold of minerals, but is an inspiring example of efficient public service. The record of the Lands Department of this State for over 50 years of important mineral development is one of which the country may well be proud, and shows that a patriotic and efficient administration of the land affairs of a State is not a human impossibility.

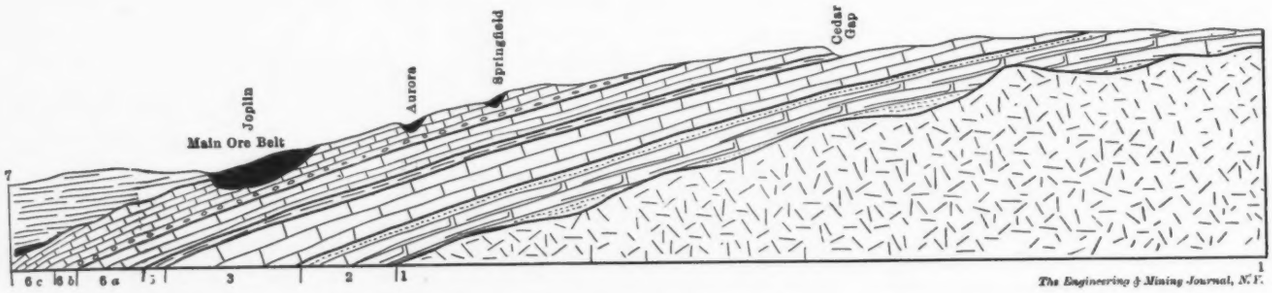


FIG. 1. POSITION OF JOPLIN ZINC BELT AT FOOT OF THE OZARK UPLIFT

*Published with the permission of the Director of the U. S. Geological Survey.

†Of the U. S. Geological Survey, Washington, D. C.

Migrations of the Joplin Zinc Belt

By Charles R. Keyes*

There is one quite remarkable feature concerning ore deposition in the Ozark mineral fields generally, and in the Joplin zinc belt in particular, that has never received the practical consideration that it deserves. It is not only important from a strictly mining standpoint, but from a purely geologic point of view it is of great interest. It is the constant shifting of position which the ore belt appears to have undergone since the present Ozark dome began to take shape and orebodies commenced to localize.

It is now pretty well understood that the present orebodies of the Ozark region are recent depositions, that they are now being formed about as rapidly as ever orebodies were in the past or as any ore deposits ever are, that they are not scattered about over the uplift promiscuously, but in accordance with definite geologic structures, and that they are confined in the main to a relatively narrow, but well defined, belt which is traceable without break for a distance of several hundreds of miles. The geologic reasons for this peculiar disposition of the orebodies are now not hard to find. Present evidences also go to show that the position of the ore belt has not always been the same as that which it occupies today, but that it formerly was much higher upon the back of the great dome.

The most noteworthy generalization regarding the geographic distribution of these ore deposits is that they are mainly restricted to a narrow band which completely encircles the broad dome at its very base. While this belt reaches practically unbroken around the entire dome, the unequal richness of the orebodies owing to local peculiarities of geologic structure, has given rise to the general impression that the ore deposits are accidentally located in a few comparatively small and indifferent areas. The impression is further strengthened by the fact that in consequence of the mining camps being segregated they have been considered as distinct mineral districts.

Later Geologic History

The possible change of position of the ore belt is a theme which for a full explanation involves something of the later geologic history of the region. These episodes began immediately before the last upraising of the region into the present dome at the beginning of which period the Coal Measures probably extended nearly or quite over the center of the area. This covering was relatively thin, having been beveled off previously. As the present dome arose the thin layer of soft shales was rapidly stripped off the hard sloping limestones beneath. A low Coal Measures escarpment, if it might be so called, everywhere faced the middle of the dome as it does today.

Considering specifically the Joplin ore belt, it was probably at one time located near the crest of the dome near Cedar Gap, but as the Coal Measures were constantly removed through general surface erosion it followed down in the pitching syncline the ever-retreating margin of the shales, which always acted as a barrier, or dam, to impound the vadose waters, or to raise the local groundwater-level. Doubtless many minor orebodies now existing between Cedar Gap and Joplin once belonged to the main ore belt at a time when it occupied that altitude, but being cut off from the parent body in some way or other remained intact without being weathered or carried away in solution to other and lower levels. The general relations of the ore belt to the geologic structure are best shown in Fig. 1.

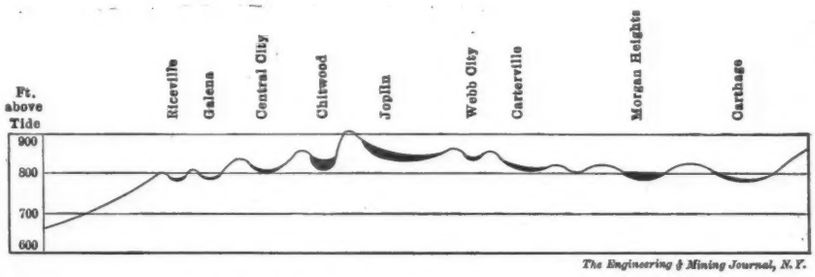


FIG. 2. PROFILE OF GRAND FALLS CHERT HORIZON SHOWING OREBODIES IN BOTTOMS OF STRUCTURAL TROUGHS

The influence of the Coal Measures margin and the so-called cross-bars of Joplin upon the movement of the ore belt down the slope of the dome is well shown in the Joplin district. For many years it has been noted that, in the vicinity of Joplin especially, the most notable inclinations of the rock-beds often strike in a northwest direction. Among the miners who are most familiar with the local conditions of the area it is agreed that the Ozark uplifting could have had no effect upon the geologic structure because the sharper bendings of the strata trend northwest instead of northeast. This idea is given greater prominence by the recent contour map of the Federal survey. While only a single prominent arch is here noted there are within the limits of the map no less than four such arches all parallel to one another. The towns of Galena, Joplin, Cartersville and Carthage lie on the eastern slopes of the several anticlines. There are other arches of the series. Significantly the main ore deposits also lie almost entirely on the east sides of the arches. With the great Joplin-Springfield syncline pitching westward and radially down the slope of the dome the minor cross-bars, or arches, act upon the general underground waters somewhat as do dams placed at regular intervals in a stream. The vadose waters are partially impounded. A model of the structure would be not unlike a system of riffles in a gold-washing sluiceway.

Considered tectonically, the cross-bars were manifestly formed at a geologic period far removed from that during which the larger Joplin-Springfield syncline originated. The latter is thought to be associated with the system of foldings now more or less pronounced that make up the Boston mountains and the Ouachita mountains to the south and that were formed before the upraising of the present Ozark dome. The former belong to a wholly different system; they are themselves flexed longitudinally. The location of the orebodies with reference to the minor warpings of the strata in the Joplin district are indicated in Fig. 2.

*Consulting geologist, Des Moines, Iowa.

According to a consular report from Hobart, by Consul Henry D. Baker, several new companies have recently been organized for the purpose of treating the complex ores of the silver-lead district of Western Tasmania. One company has a patented process for the treatment of ore containing zinc, the object being the production of zinc oxide and the recovery of silver, lead and gold as a lead bullion, and of copper as a precipitate. Another company has just obtained a concession from Parliament for a 12-months' reserve of lands near the headwaters of the Derwent river, containing valuable water-power rights, where it is proposed, if found entirely feasible, to produce electric power at low cost for the operation of works where complex ores are treated.

Greece possesses many mines, writes Consul-General George Horton, of Athens; the chief minerals are those of iron, lead, zinc, silver, etc. The mines are found chiefly on the eastern shores of the peninsula and in the islands of Aegean. Notwithstanding this mineral wealth, the industrial development of the country has been slow on account of the lack of fuel, which is nowhere found in quantity. For this reason, most of the minerals are exported in a crude state after the simplest preparation.

Gold Dredging in Russia

By I. I. Rogovin*

The Permanent Consulting Committee of the gold and platinum industries at St. Petersburg has recently published some data on dredging for gold in Russia during 1907. There were in all 64 dredges at work in that year, 25 in the Ural and 39 in Siberia, nearly all in the Yenissei Taiga. The latter, it may be remarked, work under conditions of climate, etc., quite similar to those found in Alaska and the Canadian Yukon.

In the districts studied the working season is limited by the weather, as it is impossible to operate a dredge in the winter. The average number of working days decreased from 173 in 1906 to 137.1 in 1907, with a consequent decrease in results. The following table shows the average per dredge—calculated on the whole number from which returns were received—the figures being reduced to American measures:

	1906.	1907.	Changes.
Working hours per dredge	2,837	2,259 D.	578
Gravel handled, cu. yd.	159,540	139,260 D.	20,720
Gravel handled per hour, cu.yd	56.1	64.4 I.	8.3
Gold bullion recovered, oz	1,082	1,140 I.	58

The increase of 15 per cent. in the average of gravel handled per hour is considered encouraging. It shows that the average capacity of the dredges is increasing. This is due to the fact that the newer dredges are heavier and more powerful, with larger buckets.

Some time ago the Permanent Committee appointed a special commission to determine the cost of running the average dredge during one season. After examination this commission put the working cost at 30,000 rubles—$15,450—per dredge in the Ural, and 38,000 rubles—$19,570—in the Yenissei Taiga; these sums not including cost of general management nor amortization.

It is calculated that 1 pood of the gold bullion recovered is worth about 18,000 rubles. This would make the bullion about 850 fine. One pood of crude platinum, 83 per cent., has the same value—which is equivalent to $9270 in United States money. Reducing the Russian figures to American weights and money, the committee considers that a dredge in the Ural district must recover at least 880 oz. gold bullion or crude platinum to meet the working expenses. In the Yenissei Taiga the amount required would be 1110 oz. gold bullion. These amounts, however, cover only actual working expenses; if there be added the cost of general management of the property and depreciation, or amortization of the original cost of the dredge—which items would approximate $5150 yearly—it will be seen that the average recovery in 1907, as given above, would be sufficient only to cover the cost in the Ural, while in the Yenissei there would be a deficit. To run a dredge for a season in the Ural without loss there must be a recovery of at least 1050 oz. gold or platinum in the Ural, and of 1300 oz. gold in the Siberian district.

Complete returns from 46 dredges show results as in the following table, the Russian measures being reduced to Troy ounces of gold won during the season:

	Dredges.
Between 2632 and 2895 oz. gold	1
Between 2369 and 2632 oz. gold	1
Between 2106 and 2368 oz. gold	2
Between 1842 and 2106 oz. gold	2
Between 1580 and 1842 oz. gold	8
Between 1316 and 1580 oz. gold	3
Between 1053 and 1316 oz. gold	6
Between 790 and 1053 oz. gold	6
Between 526 and 790 oz. gold	10
Less than 526 oz	7
Total number	46

No less than 23 of these dredges fell below the amount of gold estimated by the committee as necessary to pay the yearly operating expenses. That is, one-half of the dredges must have been run at an actual loss.

*Mining engineer, St. Petersburg, Russia.

Electric Power for Wisconsin Zinc Mining District

Special Correspondence

The Interstate Light and Power Company, with a capital of $750,000 has just been incorporated, with headquarters at Galena, Ill., for the purpose of constructing a large electric power plant with a capacity of about 5000 kw., and of building about 26 miles of primary power lines and 16 miles of secondary lines, these to extend throughout Jo Daviess county, Ill., and La Fayette, Grant and Iowa counties, Wis. The main transmission line will extend from Galena, Ill. to Platteville, Wis., furnishing 24 hour-lighting service to these two cities and all of the intervening towns.

This new company has acquired all of the properties, franchises and power contracts of the Tri State Light and Power Company, of Galena, Ill., and the Platteville Electric Light and Power Company, of Platteville, Wis. A large number of the principal mining companies now operating throughout this district have already made arrangements to use this electric power for operating their mines and mills, thus reducing operating expenses and removing the difficulties of coal haulage, boiler repairs, etc.

The use of electric power is particularly of advantage to new properties, which by its use may avoid investment in power station, thus confining the investment in cash more directly to the actual operations of milling and of underground development. In well developed properties the great advantage in electric drive comes through the fact that as the property extends and more power is required, the mere purchase of a motor is all that is necessary, even though this additional power is needed some distance from the mill. Electric power is the principal power used in all the great mining districts today and the Wisconsin district is to be congratulated upon the introduction of this highly economical element at this time for bringing out the undeveloped resources of the region.

The individuals interested in this project are men well known in this line of business, whose experience will insure its good management from the start. The designing engineers are H. M. Byllesby & Co., American Trust building, Chicago, Ill. The directors of the power company are as follows: A. O. Fox, Madison, Wis.; Fred Krog, Platteville, Wis.; Geo. B. Caldwell, Chicago, Ill.; M. S. Sickle, Platteville, Wis.; O. E. Osthoff, Chicago, Ill.; A. T. Rogers, Madison, Wis.; M. F. Fox, Madison, Wis.

Monel Metal Wire

In the Journal of May 15, page 988, there appeared a short note concerning wire made from Monel metal. The Orford Copper Company informs us that, while the figures concerning the tensile strength, etc., of the wire are substantially correct, the statement that the sole right to make wire from the metal had been granted to the Driver-Harris Wire Company is entirely incorrect. No exclusive rights to manufacture wire from Monel metal have been granted to any concern.

Correction

In the article "Impressions of a New Ontario Camp—Gowganda," by H. E. West, in the Journal of May 1, 1909, the expression "Rocks of the Keewatin horizon," in the first paragraph on page 901 should read "Rocks of Keewatin age," and in the third column on this page, "The Gowganda section possesses" should read "The North Gowganda section possesses."

The following notes by Professor Neumann, on the electric iron-ore reduction furnace of the Elektrometall-Aktiebolaget Ludvika, at Domnarvfet, Sweden, appear in the *Electrochemical and Metallurgical Industry*, taken from *Stahl und Eisen*, Feb. 24, 1909. The furnace is of 1000-h.p., three-phase type, with carbon electrodes and with a shaft, similar in design to a blast furnace. The hight of the shaft is 5.5 m. (18 ft.) The consumption of coke per 1000 kg. of pig iron produced has been reduced to 275 kg. Though the ore and coke used contained sulphur (0.55 per cent.) the sulphur content in the pig iron was only 0.005 per cent. The slag contained only 0.35 per cent. iron.

The Australian Oil Shale Industry

SPECIAL CORRESPONDENCE

The report of the Commonwealth Oil Corporation, Ltd., for the year ending June 30, 1908, has been issued. The company owns oil-shale deposits and coal mines in New South Wales. The oil shale is partly exported for gas-making purposes and is partly retorted on the spot. The report states that 15,000 tons of shale have been mined, of which two-thirds, being of high quality, was exported. The average yield of the entire thickness of the seam gave over 100 gal. of crude oil per ton, while the shale retorted locally contained about 70 gal. crude oil per ton. About 5000 tons of this second-class shale has been retorted at the works at Torbane. As to the extent of the shale beds, it is stated a tunnel has been driven for nearly a mile in length along the bed, the average thickness being 4 ft. without break or fault and continuing all the way of exceptionally high quality, averaging over 100 gal. crude oil per ton.

The coal mine has been opened by two shafts sunk 200 ft. to the upper coal measures; upward of 4 working places have been opened out, giving a daily production of 800 tons. The coal is used for making coke and also supplies the needs of the railway, brickworks and other consumers. Early in this year 104 coke ovens are expected to be at work. For some months 44 ovens have been in operation producing an excellent coke for which there is a ready sale. A large amount of work has been carried out in connection with the construction of crude oil works and refineries in the Wolgan Valley. The first of the series of benches, each containing 64 retorts, is well advanced. The corporation has constructed a railway line from the Government railway at Newnes Junction to the mines and works in the Wolgan valley, a total distance of 32 miles. At the Torbane works 32 new retorts have been working since August. The crude oil obtained was superior in quality to that produced by the old retorts. The crude oil has a pale olive green color with a specific gravity of 0.880 and is an excellent oil for refining. The Hartley Vale refinery is being extended, and it is expected that refined oils will shortly be placed on the market in addition to the candles and other products now being marketed.

The company hopes that the Federal Government will encourage the oil-shale industry in Australia by giving a bonus. This matter is now under consideration. The Melbourne correspondent of the *Financial Times* (Dec. 28, 1908) says that 2d. a gallon of crude oil is wanted by the Australian producers. The present consumption of petroleum in Australia is equal to 100,000,000 gal. of crude oil, which would mean the mining of 2,000,000 tons of shale per annum. A duty of 1d. on imported oil would yield nearly £100,000 per annum, the Australian consumption being now about 20,000,000 gal. Experience has shown that 1d. duty will not increase the price of oil ¼d. therefore 90 per cent. of any bounty, by which the Australian oil-shale industry can be established will be paid by the Standard Oil Trust, because nine-tenths of all the oils used in Australia come through that organization.

Lehigh Coal and Navigation Company

This company owns a large coal estate in the Lehigh section of the Pennsylvania anthracite field. It owns the Lehigh and the Delaware Division canals and several short railroads used in its coal operations. It owns the Lehigh & Susquehanna railroad, but does not operate it, leasing it to the Central Railroad Company, of New Jersey. It owns a large interest in the stock of the Lehigh & Hudson River railroad. The report for the year 1908 shows capital obligations including $19,113,000 stock and $19,188,083 in bonds.

The income account for the year, condensed, is as follows:

Net receipts from coal lands	$1,613,298
Railroad earnings	110,473
Miscellaneous receipts	243,670
Rental Lehigh & Sus. R. R	2,198,800
Total receipts	$4,166,241
General expenses	$120,805
Rentals paid	101,743
Taxes	288,483
Interest	885,124
Depreciation	300,000
Sinking fund, 5c. per ton coal mined	149,611
Loss on canals	38,305
Total charges	$1,884,071
Surplus for the year	$2,282,170

From the surplus dividends of 8 per cent. on the stock, amounting to $1,457,648, were paid, leaving a balance of $824,522. This, with $110,073 from adjustment of accounts, was added to undivided profits, the total of which was $4,294,163 at the close of the year. The net receipts from coal lands show an average of 46.6c. per ton of coal mined.

The earnings of the Lehigh & Susquehanna railroad, as reported by the lessee, were $8,387,444, a decrease of $999,935 from 1907. Of the earnings last year $5,134,355 were from transportation of coal. The anthracite coal tonnage carried was 8,671,909 tons, a decrease of 85,407 tons from preceding year.

The Delaware Division canal was opened for business on April 6 and the Lehigh canal on April 18, closing on Dec. 4 and Dec. 9. During this period a total of 252,039 gross tons was moved, 200,846 tons of it being anthracite coal. The total tonnage during 1907 was 248,820 gross tons, of which 190,205 gross tons was anthracite coal. The operating revenue fell $38,305 short of meeting operating expenses, as compared with a shortage of $33,011 during 1907. The increased deficit is principally due to unusually heavy charges for dredging and repairs.

The coal statement for the year is as follows, in long tons:

	1907.	1908.	Changes.
Mined by company	2,973,172	2,826,197	D. 146,975
Mined by tenants	269,564	290,448	I. 20,884
Total shipments	3,242,736	3,116,645	D. 126,091
Used at mines	353,845	347,733	D. 6,112
Total	3,596,581	3,464,378	D. 132,203

Of the shipments last year 124,416 tons were from lands of the Alliance Coal Company. The coal used at mines was 9.8 per cent. of the total in 1907, and 10 per cent. in 1908. A number of improvements were made during the year at collieries and breakers.

At the Lansford power plant the output during the year amounted to 3,870,105 kw.-hours, against 3,138,873 kw.-hours in 1907. The output of power is now so near the capacity of the plant that it will be necessary to make some additions during 1909 to provide the current which will be required for extending the underground haulage systems and for other mining purposes.

The chief improvement in progress is the Lausanne drainage tunnel of which the report says: "Good progress has been made in this tunnel. The face which was driven from daylight stood 5130 ft. from the portal at the close of the year, having been advanced 3067 ft. during 1908. While it is impossible to estimate the exact point at which the basin of the Buck Mountain vein will be encountered, the information available indicates that the remaining distance in rock will be between 1800 and 2000 ft. It must be remembered, however, that a very considerable portion of the drainage system will be within the Buck Mountain vein. A gangway is being driven eastward in this vein from the foot of No. 2 shaft, which will be a part of the system, and it is proposed to sink a slope about midway between the face of this gangway and the point where it is expected that the rock tunnel will encounter the Buck Mountain vein, with a view to making two additional points of attack, and thus hastening the time when this improvement will be available. The total distance in rock and coal yet to be driven before the pumps at No. 1 colliery can be abandoned is about 12,800 ft., and the time required probably 2½ to 3 years."

The 1908 production of ammonia and ammonium sulphate in the United States, according to figures collected for THE MINERAL INDUSTRY, is estimated at 87,600 short tons, valued at $5,247,240, against 89,000 short tons, valued at $5,511,770 the previous year. These figures include the production of all forms of ammonia expressed in equivalent sulphate of ammonia.

Colliery Notes

The present welfare of the coal-mining industry will be better advanced by the enforcement of existing State laws rather than by the enactment of new measures further to restrict mining operations.

When used by untrained men, the present designs of rescue apparatus are neither more nor less than death traps. However, when such an apparatus is used by a skilful man accustomed to it, the machine is almost certain to minimize the danger of colliery disasters.

Recent investigations at 36 mines, by a committee of engineers, showed that machine work, as compared with hand labor, insured a saving in cost of from 12 to 15c. per ton; the itemized cost being, for hand labor, from 36c. to $1.30, while that of machine labor averaged from 26c. to $1.12, the cost varying according to the prevailing thickness and hardness of the seams, which were from 1 to 6 feet.

The effectiveness of machinery in coal mining is well illustrated by comparing the advances of the coal industry in Great Britain and in the United States. In the United States we employ 940,618 persons in our coal mines; in Great Britain, a total of 1,059,028 persons are employed in this same industry. It is, therefore, an interesting fact that with fewer men, we, in the United States, produce 60 per cent. more coal than our British cousins.

In the establishment of a proper system of ventilation, the engineer must always remember the law of diminishing returns, and not forget that with a given fan, when we double the amount of power used, the quantity of air circulating is only increased about 25 per cent. For this reason it is always best to install a fan that is properly proportioned for the work at hand. If more work is to be done, another fan should be installed rather than overload the first one.

At one of the larger mines in Illinois where Goodman machines are used, the machine runners each get 3½c. per ton for their work; at this mine, it is common occurrence for both miners and loaders to earn $200 per month in wages. The average tons loaded per man is 15; the highest tonnage per man is 25; the lowest is 10. The percentage of screenings through a 2-in. round perforated shaker screen is never more than 30 per cent. of the output. It is said that this mine holds the State record for work done by mining machines; 200 tons of coal have been produced per single shift for each machine.

According to the most recent statistics, of the total number of mining machines in operation in America, 5911 are designated as of the pick or percussive type; 4144 of the chain-breast pattern, and 157 of the longwall-chain type. In Great Britain, in the year 1907, there were 802 longwall-disk machines, 222 of the bar type, 79 of the chain type, and 364 of the different percussive makes. The longwall-disk machines in Great Britain are generally operated by compressed air, and the chain and bar types by electricity. Chain-breast machines are as uncommon in Great Britain as the longwall-chain machines are in America.

Accidents due to absolute thoughtlessness on the part of miners continue to be recorded. A case of this sort recently occurred when a miner attempted to insert a charge in a hole that had blown out in a hard heading; the shot-firer in this instance failed to consider the high temperature that remains in a shot-hole after a blow-out shot occurs. In this case, there was sufficient temperature remaining in the hole to ignite the second charge, instantly killing the two men who were engaged on the work. At the inquest which followed, it was stated that even cold water had been splashed into the shot-hole before recharging, yet the second explosive was fired.

A fair knowledge of the geology of a coal seam is not only of great practical value to the superintendent and mine manager, but is also sure to be a valuable aid to the foreman and the miner himself. Every miner should carefully study the coal bed in which he works so that he will be able to recognize readily the cleavages of the coal, as well as its other physical peculiarities. Such a practical knowledge on the part of a miner, if applied in daily work, will not only enable a greater individual production, but will make visible many treacherous disturbances that occur in the strata, which will permit the miner to attend properly to his roof, or to handle water and gas that may be encountered. Geology can be applied at the face of a chamber underground, as well as in the engineer's office on the surface.

During recent years, several European countries have enacted laws limiting the working day to nine, and in some cases even eight hours. In this connection the great problem involved has been with regards to whether or not this plan of limiting the working day would result in an increase in production. An examination of the problem in Austria, where the law limits the day to nine hours, shows that this restriction of the hours of work has not increased the output of the miners; also that the daily wage is slightly higher for a lessened output. The most important result of such legislation in Austria was the enforced introduction of mechanical coal cutters and conveyers at the faces. The law is also said to be responsible for the migration of many good miners to Germany and America in order to earn the high wages which the local limitation has prevented them from obtaining.

An English investigator after a careful study of colliery rescue work, stated that although the various oxygen-breathing apparatus have passed the experimental stage, they are far from having reached perfection. He says that the great difficulty attending rescue work is the act of maintaining apparatus at the mines in a constant state of efficiency, for serious risks are attached to the use of such machines when they are in an imperfect condition. In speaking of the value of such apparatus, he did not refer so much to rescue work after an explosion as to the use of such apparatus in overcoming underground fires. This authority stated further that not less than five sets of apparatus should be kept in readiness at each colliery, and that no party composed of less than five persons should be permitted to enter a mine for exploring purposes; his reason for suggesting that each rescue corps be composed of not less than five rescuers is to prevent any accident in case of a mishap to one or more of the men. He says: "The splitting of a party should never be permitted under any circumstances. Everyone who has had to deal with underground disasters has experienced the difficulty of restraining men, under the influence of excitement, from undertaking rushes from which they would shrink in calmer moments."

The time is fast approaching when the manufacture of briquets in the United States will become a profitable industry. There are thousands of tons of coal dust, of small commercial value, available in all of our important coalfields, and it is almost certain that this fine coal could be made more salable if manufactured into some patent fuel. The manufacturers of briquets in Wales are now doing a prosperous business, and the fuel manufactured in the Swansea district is being exported to France, Italy, Algeria, Egypt and other countries, besides the large quantities of briquets that are sold locally in the United Kingdom. These briquets manufactured in Wales retail at 2c. each, weigh about 9 lb., and form a useful and economical fuel for the poorer classes. The heat given out is equal to that of good steam coal. Before conversion, the coal dust is well washed to reduce to a minimum the content of shale, clay, or pyrites. Bituminous coal dust, dry-steam coal dust and anthracite coal dust are mixed in such proportion as to make the briquets burn with as little smoke as possible. The dust from coal containing about 12 per cent. volatile matter, forms the bulk of the material used in manufacturing these briquets. Smokeless briquets are principally made from anthracite coal dust and a smokeless cementing material. There are many places in America where coal is so cheap that briquets could not be profitably sold; however, this patent fuel is so compact and stands transportation so well, it is safe to say that in many places where the price of coal is high, such a fuel could be sold at a material profit to the manufacturer.

THE ENGINEERING AND MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. and Treas. ROBERT MCKEAN, Sec'y.
505 Pearl St., New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
CABLE ADDRESS "ENGMINJOUR, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1908 we printed and circulated 507,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for April, 1909, was 43,000 *copies.*

May 1	12,000
May 8	10,000
May 15	10,000
May 22	10,000

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE

Editorials:
The Margin on Zinc Ore ... 1053
Mr. Lawson's New Process ... 1054
The Consolidated Coal Merger ... 1054
*The Diamond Bearing Highlands of Bahia —II ... *J. C. Branner* 1029
Gaseous Currents in Meyer's Tangential Chambers ... *V. P. Davis* 1033
*A Mexican Malacate in England ... *H. Maplethorpe* 1033
The Tasmania Gold Mining Company ... 1033
Gold and Other Minerals of Eastern Siberia. ... *S. F. G. White* 1034
*Laboratory Methods for Making Alloys of Iron and Vanadium ... *W. L. Morrison* 1035
Determination of Lead and Cadmium in Spelter ... *Eric John Ericson* 1036
Bitumen and Oils in West Africa. ... *T. Hugh Boorman* 1037
*Amatrice, a New Gem Stone of Utah. ... *Edward R. Zalinski* 1038
*Microstructure of Copper Examined with a New Etching Reagent. ... *Robert R. Abbott* 1040
The Mysore Gold Mine. ... *Special Correspondence* 1041
Determination of Copper ... 1041
A Comparison of Coal-cutting Machines. ... *Sydney F. Walker* 1042
Quebec Mining Law. *Special Correspondence* 1046
Oil and Gypsum Locations in California. ... *Special Correspondence* 1046
A Volumetric Method for the Determination of Mercury ... *W. H. Seamon* 1047
Efficiency in the Administration of the Public Lands of a Nation. *A. C. Veatch* 1048
*Migrations of the Joplin Zinc Belt. ... *Charles R. Keyes* 1049
Gold Dredging in Russia ... *I. I. Rogovin* 1050
Electric Power for Wisconsin Zinc Mining District ... *Special Correspondence* 1050
Monel Metal Wire ... 1050
Correction ... 1050
The Australian Oil Shale Industry. ... *Special Correspondence* 1051
Lehigh Coal and Navigation Company ... 1051
Colliery Notes ... 1052
*Tungsten Industry of Boulder County, Colorado in 1908 ... *R. D. George* 1055
Mexico's New Mining Code. ... *Special Correspondence* 1055
Manganese Deposits of Virginia. ... *S. Mays Ball* 1056
The Montana Mining Company. ... *Special Correspondence* 1056
Electric Hoisting and Pumping in the Cripple Creek District ... *S. A. Worcester* 1057
The Clark Copper Company. ... *Percy E. Barbour* 1057
Personals, Obituaries, Societies and Technical Schools ... 1058
Special Correspondence ... 1059
Mining News ... 1062
Markets ... 1067

*Illustrated.

The Margin on Zinc Ore

After a highly prosperous time in 1906, extending up to the middle of 1907, when the zinc smelters enjoyed the advantage of a margin between spelter and ore much larger than the average, conditions began to go against them, the margin running down to nearly $10 per ton in the second half of 1907. Throughout 1908 the margin was small, the minimum, on monthly averages, having been $6.90 in January, while the maximum was $11.74 in June. The average for the year was $10.07. In computing the margin on zinc ore, we take the difference between the value of 1020 lb. of spelter at St. Louis and 2000 lb. of blende, containing 60 per cent. zinc at Joplin. The margin is, therefore, the amount out of which the smelter must pay for the carting and railway freight on the ore, the cost of smelting, freight on the spelter to St. Louis, selling expense, and some minor items. The aggregate of these costs is a good deal more than $10 per ton of ore, wherefore, with a $10 margin, every smelter in the United States is losing money on the face of things.

However, the adversity of a $10 margin is ameliorated by several conditions. Some smelters by especially skilful work are able to recover a little more than 1020 lb. of spelter. (We are aware of claims of much higher extraction and some records appear to show it, but these are generally found to exceed the percentage computed on the basis of the input and output of a year). Some of the spelter product may be marketed, under favorable conditions, at a premium as "specials." Some smelters may secure an advantage by purchasing ores higher in iron than the average, obtainable at a profitable discount from the base price for standard ore. But all of these advantages fall short of enabling the smelter to come out even on a $10 margin.

How then can the smelters afford to buy ore for so long a time upon so unprofitable a basis? The explanation is that the Joplin product is taken to a very large extent by the zinc smelters who also make sulphuric acid out of the ore. Consequently, in buying the ore at a nominal loss they are as a matter of fact paying more or less, perhaps fully, for the sulphur value of the ore, the sulphur value being approximately $2.50 per ton of ore. These concerns are naturally a dominant element in the Joplin market. Joined with them are those concerns which buy selected ores and make especially high-grade spelter that almost always commands a substantial premium. If the concerns that make a specialty of buying ore high in iron be added, there remains but little Joplin ore for the outsiders.

In 1907 and 1908 there were in the United States 18 zinc smelting companies that were in the market for Joplin ore. The major portion of the output of the Joplin district in 1907 was purchased by six companies, each of which obtained therefrom supplies of ore in excess of 23,000 tons. In 1908 the smelters received from the Joplin district 270,000 tons of ore, of which 212,500 tons, or about 80 per cent. of the total, was taken by seven concerns, three of which made sulphuric acid, their purchases alone running to nearly 90,000 tons. The conditions in the Wisconsin ore market are similar, practically the entire production of that field being absorbed by four concerns, all of which make sulphuric acid.

Consequently it happens that when the price for spelter is high, as it was in 1906-07, and the supply of ore from the Rocky Mountain States and Mexico is abundant, the less favorably situated smelters do not have to compete so strenuously in the Joplin market, and while the price for ore in the latter may be high the margin is apt to be favorable to the smelters. But when the price for spelter is low, and consequently the price for ore is low, the supply from Colorado, New Mexico and Mexico is diminished and the smelters are forced more to the Joplin district with the natural result of narrower margin. If the supply of ore be permanently diminished by a tariff on the Mexican and Canadian product the outlook will be for narrow margin all the time, which would indicate that some of the smelters might have to go out of business.

An amendment introduced by the Finance Committee of the Senate on May 18, making the duty on spelter 1⅓c. per lb. and making zinc in ore dutiable upon a graduated scale, rising to 1c. per lb. when the ore contains upward of 30 per cent. zinc, does not materially improve the prospect for the smelters. They do not import any ore with less than 30 per cent. zinc. The concession upon lower grades is simply to throw dust in the eyes of the ignorant. The addition of ⅓c. per lb. to spelter will give the domestic industry just so much more protection against the im-

portation of foreign spelter. However, the smelters will remain in the uncomfortable position between the millstone of shortage of ore supply on the one hand and the competition of foreign spelter on the other hand. Even now spelter is from time to time imported under the drawback privilege, a practice that is certain to increase.

Mr. Lawson's New Process

Thomas W. Lawson's latest philanthropy to the public, which he wants to see get rich quick, loudly heralded in advance, turns out to be the offering of the stock of the Santa Rita Mining Company, and the "Process Copper Company." The mining company owns the old mines at Santa Rita, Grant county, New Mexico, which various persons have tried to work during their long and checkered career. According to John M. Sully they possess large deposits of low-grade ore. Mr. Lawson now thinks that he has found the key to success in a new hydrometallurgical process, invented by Charles S. Bradley, who is well known by the invention of some details that were of importance in the aluminum industry.

Mr. Lawson introduces his new scheme by publishing an octavo volume of xlviii+252 pages about it, in which italics and black-letter type of various sizes are profusely employed. Let not the reader expect, however, 300 pages of unalloyed pleasure, or anything like another "Story of Amalgamated," distributed gratis. In the present volume, pages 1 to 74 are occupied by a report by Mr. Sully on the Santa Rita mines. Pages 75 to 248 give the result of 8094 samples, which far outdoes old Homer's catalog of the ships, and would hold the record for aridity were it not for Vega's tables of logarithms. Alas, Mr. Lawson, that you should be uninteresting!

We have looked through these 300 pages with a microscope to discover something of the nature of the Bradley process, but although we used an instrument of 100 diameters magnifying power, we failed to find more than a trace, the latter a remark that the process is being applied on a practical scale within gunshot of New York. Mr. Lawson also in an "important amendment" on page xxxii disclaims all previous statements that the process will extract 100 per cent. of the copper of the ore, and conservatively remarks that he means the recovery of "a very large proportion of the copper which remains in any ore after every other known process has extracted the copper up to its limit."

The Consolidation Coal Merger

A good deal has been said in the press during the past week about the formation of a "soft-coal trust," the moving cause being the announcement of the merger of the Fairmont and other coal companies in Pennsylvania and West Virginia with the old Consolidation Coal Company, of Maryland. As a matter of fact, the change brought about by the merger is only one of form. The Consolidation Coal Company was the first and the largest operator in the well known Cumberland or George's Creek basin on the Maryland side of the upper Potomac. It developed that field, which produced a coal of unusually high grade, and built the railroad which connected the mines with the Chesapeake & Ohio canal and the railroads at Cumberland. The field is one of the oldest producers in the country; it has been mined for the best part of a century, and the managers long ago foresaw its approaching exhaustion. To provide for this they acquired control of coal lands in the adjoining Fairmont field in West Virginia and in Somerset county in Pennsylvania. These lands were held by separate companies, but control of these was retained by the Consolidation Company. The merger, therefore, adds nothing to the actual holdings of the company, but will only simplify its management.

While there is nothing in the nature of a trust, it may be said the company owns one of the largest and best blocks of coal land in the country, its total extent being about 200,000 acres, and the underlying coal of the best quality. Its technical management has always been good, and its mines have been well and economically worked, as a rule. The company has had very few strikes in its history, and its miners have not been willing to leave it, largely because mining on the Big Vein of the Cumberland regions is much easier work than in the mines in the Pittsburg and other districts.

It may be noted that a controlling interest in the Consolidation Coal Company was for many years held by the Baltimore & Ohio Railroad Company. About the time of the passage of the Hepburn law that company sold its stock to a group of Baltimore men, who were independent, but yet inclined to work with the railroad, in which also they were interested.

In our issue of May 1, 1909, in reporting the production of copper in North America and in the world, we made a mistake in giving the production of Canada in 1908 as 55,781,992 lb. That figure was indeed the aggregate of the figures reported by the smelters, but we neglected to deduct 2,056,779 lb. of copper in ore shipped to them from the United States. The failure to make this deduction, of course, caused a duplication in the statistics for the United States and Canada. The correct figure for Canada in 1908 is 53,725,213 lb. Carrying forward this correction to the statistics for the world, and also making a change in the statistics for Russia for which we have later received the official figure, the production of copper in the world in 1908 was 760,773 metric tons against 722,655 in 1907.

The iron and steel trades do not seem to be suffering very severely from the "open market," from which some operators—and some of our contemporaries—predicted such dire results would follow. The current reports of production show that mills which were operating to 50 per cent. of their capacity and even less, are now running up to 75 and 80 per cent., and even full in some cases. Eighty per cent. is a pretty good return for a capacity which has, in most cases, been adjusted to boom times. Moreover, a number of the larger companies which reduced wages in April have announced that they will return to the old schedules on July 1; this action being voluntary on their part, with no hint of strikes. All of which seems to show that the open market has its advantages.

Henry H. Rogers died May 19. His record as president of the Amalgamated Copper Company has often been commented on in the JOURNAL; it is sufficient to say here that he made of it one of the great industrial enterprises of the country. His latest work was the construction of the Virginian railway, intended especially to promote the coal trade of West Virginia.

Tungsten Industry of Boulder County, Colorado, in 1908

By R. D. George*

The financial stress which developed in the latter part of 1907 paralyzed the tungsten-mining industry, and for several months the camp was very quiet. Several of the larger Colorado producers in Boulder county closed down completely, a number of the smaller companies went out of business, and consolidations still further reduced the number of producers. It was not until the latter half of 1908 that the camp began to come to itself again. Since that time activity has increased, and the present year promises a large measure of prosperity.

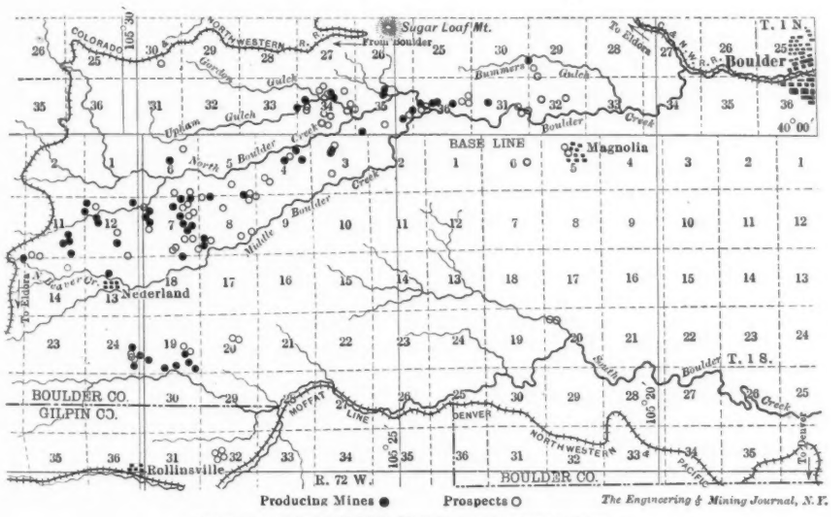
One of the notable events of the year was the organization of the Primos Mining Company, which bought the tungsten mines of the Cardinal company, and those of the Stein & Boericke company. C. F. Lake, formerly manager of the Cardinal company, is the manager of the new company. The Philipp Bauer company, which held a lease on the Rogers group of about 2000 acres in the tungsten district, gave up the lease and retired from the field. Eugene Stevens, formerly manager for the Philipp Bauer company, now holds the lease, and has already commenced the vigorous development of some of the mines.

The Cardinal company kept a force of men on development work, and has opened up in the Conger, one of the largest, if not the largest, body of tungsten ore yet found in Boulder county. Promising finds have been made in other mines formerly belonging to this company, but now held by the Primos Mining Company.

The principal producers for the year were: The Primos Mining Company, the Philipp Bauer company and the Wolf Tongue company. Probably 75 small producers contributed to the total output largely, however, as a result of the development work undertaken. Most of their ore was treated at the Wolf Tongue mill at Nederland. A number of good finds were made in the southern part of the district, particularly near Manchester lake. High-grade ore in promising quantities has been opened up in the Boulder Falls part of the district, and this area is likely to make a good record when mining activity is fully restored. Some development has been done in the vicinity of Ward, not far from Gold lake, but no shipments have been made.

In the matter of concentration, some progress has been made. The Cardinal mill was improved by the addition of a large area of stationary canvas. The Clarasdorf mill built by the Philipp Bauer company uses a jaw crusher and rolls instead of stamps. The problem of concentration is still a difficult one owing to the character of the ores. Ferberite is an extremely friable mineral and under the stamps slimes badly. Much of the gangue is hornstone and silicified country rock which are by no means friable. Again, a portion of the ore is in the form of minute grains of ferberite in a hornstone matrix. This needs very fine crushing in order to make anything like a satisfactory saving. The millmen of the district are alive, and are undoubtedly nearing a solution of the problem.

As to the future of the district, the producing area is today larger than ever and the deepest workings show no falling off either in quantity or quality of ore. With satisfactory prices for the product, the camp would show an increased production. The production for 1908 was as follows: Ore mined and concentrated, 3450 tons; high-grade ore ranging above 25 per cent. of tungstic oxide, 180 tons; concentrates, 407 tons; total value, $167,257.



MAP OF THE BOULDER COUNTY TUNGSTEN FIELD

*Director, State Geological Survey of Colorado.

Mexico's New Mining Code

Special Correspondence

The new mining code for Mexico is up for discussion in the Chamber of Deputies and the proceedings of the legislative branches on this matter are watched with much interest. The failure of Congress to enact the law at the December session, after it had been referred by the President and the cabinet, with the so-called anti-foreign clauses eliminated, created a feeling that some strong influences were at work which might be able to revive the objectional clauses for discussion and possibly enact them into a law. This impression was given color from the fact that the code, or law, was a measure, which, by special act of Congress, in accord with other similar cases, the President could, at his option, decree, enforce or refer to Congress for approval. It is likely that the reference of the law to Congress was because of its great importance and its broad scope.

The delay, however, lent color to the belief that the advocates of the anti-foreign clause would, at least, make an attempt to overrule the expressed policy of the executive.

The preliminary discussion on the law was related to the fundamental question of federal and states rights. The new law increases federal jurisdiction in matters relating to mining and it is on this that argument is made against the law. The ordinances of Philip II, in 1584, made the central government supreme in matters relating to mining. The famous "Ordinances of Mining," promulgated in 1784 reasserted the principle of crown ownership of minerals and the right of control by the crown. These remained in force, with some modifications, after independence. In 1857 a new constitution for the Republic was adopted which specifically left the states free to enact their own laws in regard to mining, and did not recognize the power or right of the general government as was established from the time of the ordinances of 1784. Only two states, Durango and Hidalgo, took advantage of this and enacted special codes. In 1883 the federal constitution was amended conferring on the general government exclusive power to legislate upon mining matters and in 1884 a new mining code was adopted which superseded all other laws, state and federal. This remained in force until 1892 when it was superseded by the present code. Both the laws of 1885 and of 1892 recognized the full federal control of mining but they did not go so far as to jurisdiction in regard to legal questions as does the new code now under discussion. The question has other bearings also and is likely to be fully discussed by the deputies.

Manganese Deposits of Virginia

By S. Mays Ball*

The manganese deposits of Virginia have for years afforded the principal domestic supply of high-grade manganese ores. The deposits, however, are pockety and are higher in silica and phosphorus than the Brazilian ores, but are suitable for many purposes. Deposits of manganese ore, according to the reports submitted to Commissioner G. W. Koiner, include high-grade oxides and manganiferous iron ores, and occur widely distributed throughout the State, particularly along the James river valley, and the Shenandoah, or Valley of Virginia.

At the Crimora mine, which is one of the most important deposits, a synclinal basin in the Potsdam sandstone approximately 900 ft. long by 500 ft. wide, has been filled with the clay derived from the decomposition of the ferruginous shales overlying the massive sandstone. The manganese, originally disseminated through the rock, has now become concentrated in the clay resulting from its decomposition. The ore, which is psilomelane with a little pyrolusite, is found irregularly distributed through the clay in nodular masses varying from pebble size to lumps a ton or more in weight. These deposits have been developed by means of a shaft with levels driven at 75 and 105 ft. The maximum thickness of the Crimora ore-bearing clay is apparently about 300 ft. The ore is crushed, washed and screened to remove fines, and after drying is ready for shipment. The lump ore has been mostly sent to England and the fines to Pittsburg. This mine has produced up to 50 tons per day of the highest grade ore, the composition of which is shown by the following analysis, made by Prof. A. S. McCreath; Mn, 57.291; Fe, 0.373; P, 0.075 per cent.

At other points in the James river valley and the Valley of Virginia, deposits have been opened and developed to some extent. Near Norwood, on the James river, and about two miles from Midway Mills, a deposit of high-grade manganese was opened some years ago and about 500 tons of ore of excellent quality was mined and shipped. This mine, however, was shut down on account of insufficient equipment to handle the water. The ore produced contained about 58 per cent. manganese, 1.5 per cent. iron and about 0.15 per cent. phosphorus. In the same locality, near Warminster, another deposit was opened and yielded a considerable quantity of ore similar in character to that mined at Norwood. Farther up the river, in the vicinity of Mount Athos, a deposit of good quality was mined to some extent.

At several other places on the southwest continuation of the Middle James river iron belt through Campbell and Pittsylvania counties, deposits of promise have been opened. One of the most recent openings near Hurt Station in Pittsylvania county has indications of a considerable deposit of high-grade ore. From the large number of surface samples received by the commissioner there seems to be numerous deposits along this iron belt that are worthy of investigation. A few miles southeast from Mount Athos at Concord in Appomattox county, several openings have been made and some good ore exposed. From those openings analyses of two samples show a manganese content of 66.6 and 52.9 per cent., respectively. Deposits are also reported in the vicinity of Willis mountain, Buckingham county, and near Spiers mountain, but only surface samples have been obtained from those localities. Undeveloped but prospected deposits have also been reported from Albemarle and Orange counties.

In the northern portion of the Valley of Virginia the manganese production has been chiefly in the form of manganiferous iron ore, though deposits of high-grade ore have been opened at a few points. In Page county, manganiferous iron ore has been mined about three miles east of Milne's station and a promising deposit of high-grade ore, apparently of considerable extent, was found on the Garrison tract about two miles east of the railroad. The following two analyses by Prof. A. S. McCreath show the character of the ore: Fine ore, Mn, 52.691 per cent.; Fe, 2.325; P, 0.324; SiO_2, 2.795; lump ore, Mn, 53.656 per cent.; Fe, 1.537; P, 0.327; SiO_2, 1.955. In Rockingham county manganiferous iron ore of quality suitable for the manufacture of spiegeleisen has been opened on Big Run creek.

In Augusta county the clays derived from the Potsdam sandstone have yielded manganese ores at several places north and southwest of Crimora. North of Crimora a deposit was opened at Grottoes yielding ore carrying 48.7 per cent. manganese, with a silica content of 6.98 per cent. and 0.40 per cent. phosphorus. A few miles northeast of Elkton an opening was made from which samples of high-grade ore were taken. Near Sherando a number of years ago several hundred tons of high-grade ore were taken out of open cuts, the results pointing to the existence of a large amount of ore in this locality. At Lyndhurst station deposits are also reported and a few miles southwest of Lyndhurst the Kennedy mines produced a considerable amount of 43-per cent. ore. Cutting southwest at Vesuvius, in Rockbridge county, there is a deposit of rich manganese ore and at Midvale in the same county, another deposit exists from which good ore was obtained.

In Botetourt county a highly manganiferous iron ore has been extensively mined and shipped from the Houston mines, near Houston station. In places the bed contains pure manganese ore. The following analyses by Prof. A. S. McCreath show the composition of the manganiferous iron ore: Mn, 24.7 per cent.; Fe, 29.1; P, 0.138; SiO_2, 7.7. In other parts of this county prospecting has been carried on and more or less ore taken out at different places. In Roanoke county prospecting was done some years ago, a few miles southeast of Roanoke, and some high-grade ore was found.

Occurrences of manganese and manganiferous iron ore are reported from the southwestern counties of the State. In Lick and Draper mountains, Wythe county, Flat Top mountain near the Bland county line and in the mountains in the western part of Bland county, surface work has been carried on and some promising ore exposed. In Smyth county, near Marion, the Stalie's Creek Manganese Iron Company has opened a bed of high-grade psilomelane which it is developing. Many other surface samples received from the southwestern portion of the State indicate the occurrence of manganese deposits over a large area, the extent and economic value of which can be determined only by further development.

*Atlanta, Ga.

The Montana Mining Company

Special Correspondence.

The report of the Montana Mining Company for the year ended Dec. 31, 1908, states that there was a loss for the year on revenue account of £4582. Legal expenses, incurred prior to the existing lawsuit, amounted to £1776. At Marysville, Montana, the injunction on the compromise ground put a stop to operations and the only revenue derived was that obtained from shipping ore recovered by leasers and from the clean-up of the mill. There was an expenditure of $20,416 on shaft sinking on the Compromise ground and of $2513 in connection with pending litigation.

At the Lucky Girl group of mines at Edgemont, Nevada, 4531 ft. of development work was done on the Lucky Boy or Upper Vein, and 1136 ft. in driving the Deep Tunnel. The output from Jan. 1 to Nov. 30, when the mine was temporarily shut down, was 19,800 tons of ore from which bullion to the value of $127,857 was realized, being an average of $6.46 per ton. The working expenses amounted to $102,872 or an average of $5.19 per ton. The operating profit was reduced to a deficit by charges for fire insurance and prospecting expenditure in the upper levels of the mine.

The Nevada property was worked for eleven months. In November the stopes suddenly and simultaneously became impoverished, and could not be worked at a profit. It was decided, therefore, to shut down pending completion of the tunnel and installation of electric power, when

the low-grade ore exposed in the upper levels of the mine can be more economically and expeditiously handled than it is possible to do at present.

As regards litigation, the St. Louis Mining and Milling Company applied to the Federal Court for the State of Montana for an injunction on the Compromise ground, which was granted on Jan. 27, 1908, thus bringing work there to a full stop. Against this injunction the Montana company appealed to the Circuit Court of Appeals at San Francisco, the result of which was to affirm the action of the lower court; the consequence being that the company was tied up as it was last year. The suit is set for trial on June 14 of the present year.

Electric Hoisting and Pumping in the Cripple Creek District

By S. A. Worcester*

The fact is gradually becoming appreciated by mining operators in this district that electric power is now being furnished for the various operations of mining and milling, at rates that are lower than are made elsewhere in the State, and so low that, except for temporary plants, steam power cannot approach the electric plant in economy. My experience with induction motors, using current from central stations, for mining purposes in various mining districts, has inclined me strongly toward this convenient and economical form of power. While small electric hoists have come quite largely into use in this district, they have seldom, if at any time exceeded 30 h.p. in size, and no balanced electric hoisting has yet been done in the district.

A Fifty-h.p. Electric Hoist

A 50-h.p. electric hoist, using a skip and overbalance weight, also an automatic side-dump waste car, designed by me, is now about ready for operation at the intermediate shaft of the drainage tunnel. An interesting feature of this plant is the weight; this consists of a steel water tank partly filled with water. As soon as connection has been made from the intermediate shaft to the tunnel portal, this tank will be filled with water, when the skip is at the tunnel level, so as to overbalance the loaded skip, which is then hoisted, the speed being regulated by the hoist brake. When the load has been hoisted and dumped, the tank, being then at the bottom or tunnel level, is automatically emptied, the water passing out through the tunnel. The empty skip then overbalances the tank and is lowered, using the brake as before. A stream of water which flows near the shaft will thus be made to furnish power for the hoist. The tank will be filled and emptied automatically. The electric side-dump car, operated by the engineer from his station at the hoist, saves one man's wages per shift and is an inexpensive arrangement. It is provided with a safety switch, so that if the engineer fails to stop it at the end of its outgoing trip, no damage will result, and the car will dump itself and return without attention.

*Mechanical engineer, Victor, Colo.

Saving in Power Cost

The saving in cost of power by using electric current instead of steam, will approximate 50 per cent. for this plant. The estimated saving per day for a 100-h.p. overbalanced electric hoisting plant, which I designed several months ago, over a modern steam-hoisting plant, was $14 in two 8-hour shifts. The overbalanced hoisting system, now used by several mines in this and several other States, has great advantages over any other system, as applied to the majority of our metal mines in the Rockies. Four ore-handling plants on this system are now in operation in this State, the largest being the 5½-ton electric skip-hoisting plant of the Liberty Bell mine, at Telluride. This mine has the largest skip in use in the State, with a tail rope and tension carriage, and an overbalance weight of 14,000 pounds.

A few figures will show clearly the saving effected by overbalanced hoisting, as compared with unbalanced hoisting. Assuming an ore load of 2000 lb., and a skip weighing 1500 lb., to be hoisted a distance of 1000 ft., using ¾-inch steel rope, the total starting load is 4390 lb., and the average load during the hoist is 3945 lb. By using an overbalance weight of 2500 lb. the total starting load is reduced to 1890 lb., and the average to 1000 lb., or one-half of the load of ore, power being used in both directions. The necessary size of motor or engine will be in the ratio of 4.39 for the unbalanced plant, to 1.89 for the overbalanced hoist, or 2.32 to 1, and the power consumption will be as 4390 to 2000, or 2.2 to 1. If, as in the case of the Liberty Bell plant, a tail rope with tension sheave is used, the unbalanced rope load at starting is eliminated and the starting load becomes 1000 lb., the uniform load from beginning to end of hoist. The ratio of the size of motor or engine to that for the unbalanced hoist then becomes as 1 to 4.39, an immense difference, and the efficiency of the motor is much better, owing to the uniform load. Friction, which should not exceed 10 per cent. with any arrangement, has been ignored in these figures. If a steam hoist is used, a very small boiler capacity, relatively, is needed for the overbalanced plant, because of the much smaller and more frequent demand for steam. In a recent design of an electric-hoisting plant it was found that with the unbalanced arrangement the power company refused to furnish current for the large motor required, unless a rotary converter or equivalent device were installed, in order to reduce the immense drop in line voltage which would result from starting so large a motor at full load. By using the overbalanced tail-rope system the size of motor was reduced so as not to be objectionable and the cost of the electrical equipment became about one-third of that of hoisting unbalanced.

The great majority of mine shafts in Colorado have but one hoisting compartment, and the expense of enlarging these shafts, or sinking new ones, in order to use two compartments for balanced skips or cages is in most cases prohibitive. By simply lengthening the skip, or using a long or deep skip, as is done at the Findley and Liberty Bell mines, in this State, and the Original and Stewart mines, in Butte, is is possible and highly economical to hoist an immense tonnage through a single-compartment shaft.

Pumping

Estimates recently made for two of the larger mines of this district show that their pumping can be done by electric power at a cost of about one-half that of the present cost of pumping by steam. The simple expedient of attaching a substantial crank and gear-driving movement to the plungers of the present steam pump, eliminates the expense of a complete new pumping plant. The cost of additional equipment for electric pumping in these cases will be saved in three to five months of continuous operation. Owing to the fact that pumping gives a uniform 24-hour load, the power companies make a lower rate for this service than any other. In some cases it is possible, by allowing a large sump to fill during working hours, to do the major portion of the pumping during hours when the power company is underloaded, in which case the rates will be made extremely low, on account of the desirable character of the load. It is now very generally known throughout the district, that for continuous operation, lasting for a considerable period of time, even the most economical steam plants cannot compete with electric power in economy.

The Clark Copper Company

Inasmuch as it was announced in the personal column of the Journal (a statement that the Journal was fully justified in making) that I had assumed the management of the Promontorio mines in Mexico for the Clark Copper Company, I beg to state that I am no longer connected with that company in any way, and I disclaim any responsibility whatsoever for any of its projects, either mining or milling, now in hand, or to be undertaken.

Percy E. Barbour.

Los Angeles Cal., May, 7, 1909.

Personals

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Rowland Cox, of New York, is in Monterrey, Nuevo Leon, Mexico.

A. G. Larson, superintendent of the Le Roi mine at Rossland, B. C., was in Utah recently.

H. M. Montelius, of New York, has been examining property in Clear Creek county, Colorado.

S. J. Speak, of Hooper & Speak, left London on May 1, for West Africa, on professional business.

Rodolphe L. Agassiz has returned to Boston after an extended visit to the Lake Superior district.

Walter Ragland, formerly a mine inspector of the State of Missouri, is mining at Neck City, near Joplin.

J. Morgan Clements, mining geologist, has returned to New York from a professional trip to Cananea, Mexico.

Thomas G. S. Hersey, an English mining man, who is largely interested in Gowganda properties, is in Toronto.

Sir Robert Perks, of London, is in Ottawa in connection with the construction of the projected Georgian Bay Canal.

Lt.-Col. H. Alexander Judd, who has been examining mines in New Mexico for London capitalists, has returned to England.

Fred McL. Strout, of Denver, has taken the management of the Protective Gold Mining Company, near Central City, Colorado.

George H. Hall, secretary of the Cleveland Rock Drill Company, Cleveland, O., has been in New York, on business for the company.

John O'Dea, manager of the Geneva Extension Mining Company, of Georgetown, Colo., has returned from a business visit to Fort Worth, Texas.

R. Randolph Bruce, formerly manager of the Paradise mine in Windermere district, East Kootenay, has returned to Wilmer, B. C., from a trip to Scotland.

Capt. Hiram Griswold, formerly manager of the Union Copper Mines, of Gold Hill, N. C., has taken charge of the Blue Wing Copper Mine at Virgilina, Virginia.

Louis Janin, Jr., well known as a mining engineer, and formerly on the staff of the JOURNAL, has recovered from a long illness, and is now in San Francisco.

S. E. Bretherton, of San Francisco, is spending a few days in Shasta county, Cal., on business for the Friday-Lowdon Copper Company whose property joins the Mammoth mines.

Alexander E. Outerbridge, Jr., has returned to Philadelphia from Jamaica, where he made an examination of the work in progress on a copper claim which is now being explored.

Henry P. Lowe, of Denver, who is managing director of the Frontenac Mines Syndicate, Ltd., operating in Gilpin county, Colo., has left for London, England, on a mining business trip.

W. W. Leach, of the Geological Survey of Canada, was in Victoria, B. C., recently, on his way north, to resume his geological work in the Skeena river district of British Columbia.

Ernest Stenger, formerly with the Denver & Rio Grande Western railroad, has been appointed general traffic manager for the Utah Copper and the Ray Consolidated Mining companies, with office at Salt Lake City.

H. Irving Jones, who has been manager of the Aztec Mines Company at Central City, Colo., for the last two years, has accepted the position of superintendent for the Sunnyside Mines Company at Eureka, near Silverton, Colo., and has assmued his duties.

Dwight T. Randall, late engineer-in-charge of fuel tests, Technologic Branch, United States Geological Survey, has associated himself with the Arthur D. Little Laboratory of Engineering Chemistry, of Boston, in charge of the Department of Fuel Engineering.

Sir W. Thomas Lewis having been unavoidably prevented from accepting the presidency of the Iron and Steel Institute, to which he was elected at the recent annual meeting, the council has requested Sir Hugh Bell, the retiring president, to serve for another year, and he has consented to do so.

Thomas Kiddie, of Northport, Wash., manager of Le Roi Mining Company's smelter, has been appointed representative of the Nicola Valley Coal and Coke Company on a board of conciliation and investigation under the Canadian law to deal with a labor dispute between the company and its men employed at the Middlesboro' colliery.

Obituary

Walter Dusenbury, a mining engineer, was accidentally killed by a train on the West Shore railroad at Bogota, N. J., May 12.

Robert S. Brown died at Easton, Penn., May 16, aged 61 years. He was for many years a prominent slate operator and quarryman in the Bangor district in Pennsylvania, and had been president of the American Slate Company since its organization.

Ambrose H. Douglas died at the Leonesa mine, Matagalpa, Nicaragua, on May 1. He was well known at Silver Peak, Tonopah and other Nevada camps as a miner of ability and a man of upright life. He went to Central America from Nevada not long ago.

John Strang died at Salt Lake City, Utah, May 9, aged 39 years. He was born in Clackmanan, Scotland, and came to this country with his parents in 1878 and settled in Ogden. When a lad be engaged in mining with his father at Almy, Wyo., and later went to Scofield, where he became an employee of the Utah Fuel Company. He worked in the mines at Scofield and Winter Quarters and also at Castle Gate, where he assisted in opening up that vein of coal under the superintendency of W. G. Sharp. About 1892 he turned his atention to metal mines. He supplemented his practical experience with a close study of the theory of mining. He followed mining in Eureka, Utah. About eight years ago he was placed in charge of the Tetro mine and since remained at that mine as foreman and as superintendent.

Societies and Technical Schools

Montreal Technical School—The contract for the erection of the new Montreal Technical School building has been awarded to Peter Lyall & Sons, of Montreal, for $387,000. The architect is J. S. Archibald and the building will be erected on Sherbrooke street, between Mance and Church streets.

Canadian Mining Institute—Secretary H. Mortimer Lamb has received the following letter from Hugh F. Marriott, of London, England: "Mr. W. Frecheville, Mr. R. E. Commans and myself, as members of the Institution of Mining and Metallurgy, having a lively recollection of the friendly feeling engendered and the delightful hospitality experienced at the hands of the members of your society, wish to farther express our appreciation in a small way, which we hope will be acceptable to your council. We offer a prize of $250 for the best paper written for your society, to be decided by your council during the year 1909, on mining and metallurgical subjects within the Dominion of Canada, describing the advancement made in the branch selected, in the 12 months following the conclusion of our recent excursion. Competition to be limited to the younger members of the various grades of the society, say, under 30 years of age. These are the outlines on which we consider the prize will give a stimulus to your younger members, both to show their ability and to produce a paper of particular interest to those of your friends who will recall their experiences on the visit."

The gift has been accepted by the council of the Institute and a special committee —consisting of Professor J. Bonsall Porter, H. E. T. Haultain and J. C. Gwillim —has been appointed to see that the conditions are properly carried out. Papers must be in the hands of the secretary before Jan. 1, 1910.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Butte, Denver, Indianapolis, Salt Lake City, Mexico, London, Paris

REVIEWS OF IMPORTANT EVENTS

San Francisco

May 12—At the recent meeting of mineowners in San Francisco, to consider the eight-hour law, it was resolved, as stated last week, to count as working hours only the time actually spent "at the face." As further indicating the sentiment on this particular question of interpretation to be given the law pending the trial of a test case, a number of mine owners and operators suggested the following interpretation of the provisions of the law.

1. That eight hours' work shall be done at the face underground, the men going to and from their work on their own time.

2. That the time shall count from the time they commence work at the face, or their working place underground, and extend until they quit work at their working place.

3. That neither the law itself nor these foregoing provisions apply to men working on the surface, except those actually employed in reduction works.

4. That all employees, both on the surface and underground, shall be paid by the hour for time actually at work.

In making these suggestions the committee of mineowners desired that all the acts of the operators, managers and mineowners, during the pendency of the test litigation, should be fair and should be aimed at a conservative construction of the law, so as to avoid misunderstandings with employees and to avoid disagreeable features of arrest and court proceedings throughout out the State.

It is generally believed, nevertheless, that the interpretation as suggested by the operators in Tuolumne and Calaveras counties, should be generally accepted by the owners and operators throughout the State, so as to observe uniformity. The law will be fully observed in the event that it is declared constitutional and it is suggested to the various owners, operators, superintendents, etc., to inform their employees that the law is being tested with a desire to determine its validity, and of course, if valid, it will be upheld. Pending this determination by the courts, however, the employees have been asked to join with the operators in a fair temporary interpretation so as to avoid unnecessary disputes and court proceedings. This request has not been uniformly complied with as many of the miners relied upon their local unions to take up their side of the question and compel immediate compliance with the law on the part of the operators. The mineowners of the State are now collecting funds to test the case and are collecting them on the basis of 50 cents per man employed.

The eight-hour law for underground miners and men employed in mills, smelters and other reduction works, which went into effect May 9, has already commenced to start trouble between mining companies and their employees. At the Sierra Buttes mine, Sierra City, the men were getting $2.25 per day and board and this was reduced to $2 per day and board, whereupon the miners quit work and the plant has closed down. At the Penn Chemical Works, Campo Seco, Calaveras county, the company has ordered that the men go to their work on their own time instead of owners' time, and the entire eight hours must be spent in actual work. It is expected that this copper property will also close down. At the mines of the Standard Consolidated Mining Company, Bodie, Mono county, where they pay $4 per day for 10 hours work—the highest wages in the State—the miners threaten to strike if wages are cut down when the eight-hour schedule is in force by law. A number of other instances of similar nature might be cited, and within the next few days there will be hundreds of other cases of strikes in the mines and mills.

The 7000-ft. Spring Garden tunnel of the Western Pacific Railway company, near Quincy, Plumas county, has been completed, benches and all. The Chilcoot tunnel, 6400 ft. long, in the same county will be finished this month. Though in the midst of a mineral section where there are numbers of quartz mines, not a sign of mineral was discovered in either of these railroad tunnels, much to the disappointment of the mining men of that region.

The Associated Oil Company of this State has voted to issue bonds to the amount of $25,000,000. Of this sum $6,000,000 will be expended immediately in constructing a pipe-line from Coalinga, Fresno county to San Francisco bay, and another from McKittrick, Kern county across the mountains to Gaviota on the Santa Barbara county coast line.

Butte

May 13—J. Herbert Anderson, president of the Panhandle Smelting Company, was acquitted, at a preliminary hearing, of the charge of embezzlement preferred against him by John Mocine, receiver of the company, and it is probable that the case will go no further. The charge was that Anderson had drawn a check for $1750 on the funds of the company with which to pay a personal debt. A suit asking that a receiver be appointed for the Amador Consolidated Mining and Development Company has been instituted in the local district court as Missoula by 750 stockholders representing about 580,000 shares of the company's stock. The complaint alleges mismanagement of the company's affairs for a long period of time, and it is stated that the officers and directors of the company are not acting in the best interests of the stockholders.

The purchase of the Pittsmont company's property having been ratified at a special meeting of stockholders of the East Butte company held this week, the latter company now intends to issue 60,000 shares of its treasury stock for the purpose of forming a working capital. The stock will be issued to stockholders on the basis of one new share for four of the old. J. H. Reid, of Pittsburg, one of the largest stockholders in the Pittsburg company, will become a director of the East Butte company. Three hundred thousand shares of East Butte stock will be used to acquire the securities of the Pittsmont company, now held by the banks of Pittsburg. The United States Fidelity and Guaranty Company has instituted action against the Reins Copper Company for the sum of $1250, and Morely & Thomas, Butte real estate dealers, have instituted suit against the same company for the sum of $637.37. The company's Ella and Combination quartz claims also have been attached.

The State Board of Railway Commissioners will hold a hearing some time this month at Helena to consider the question of establishing a connection between the Chicago, Milwaukee & Puget Sound and the Billings & Northern railways at some point in Fergus county. The roads parallel and cross each other, but have no connecting point and it is for the purpose of suiting the convenience of shippers by making some connection that the hearing will be held. The application of certain stockholders for the appointment of a receiver for the Kimberly-Montana Gold Mining Company was recently denied, the court holding that, since the Federal court had under consideration a petition that the company be adjudged a bankrupt, the State court was without jurisdiction to appoint a receiver.

Denver

May 15—The Doctor-Jack Pot Mining Company, in the Cripple Creek district, will pay a dividend on June 1 of $14,000. The company has $65,000 in the treasury and the property is now being operated by 15 sets of leasers. The total production of this property to date is about $2,840,000. The shaft, now 700 ft. deep, is to be equipped with a new electric hoist and compressor. The Gaylord cyanide mill at the Jerry Johnson mine, on Ironclad Hill, is now running on the low-grade ores from that mine. It is expected to treat 50 tons daily. The El Paso Consolidated Gold Mining Company, which is credited with a gross production of $423,000 last year, has now granted 31 leases, and is also operating a portion of its territory on company account. About 150 miners are now employed, and this number will be increased. The El Paso mine will be the first to be reached by the deep drainage tunnel. An important strike, proving the continuity of rich ore with depth, is reported in the American Eagle, of the Stratton Estate, at a depth of 1500 ft. from the surface, this being the deepest shaft in the district.

One of the big mining enterprises in Clear Creek county of which little is said in the press is that of the Waldorf Consolidated Mining Company, which owns 600 acres of mineral ground and has over 40,000 ft. of underground workings. The mines are developed by a crosscut tunnel 6000 ft. in length, intersecting the fissure veins of Mount McClelland, and exposing by drifts and raises ore of an estimated gross value of $5,000,000. Two concentration plants at the mine have a capacity of 100 tons per diem and additional concentrating machinery has been ordered. Owing to the low price of metals, no production was made last year, and the work was confined to creating reserves of ore. but heavy shipments are to be made this year. The company owns its own railway, the Argentine Central, connecting with the Clear Creek branch of the Colorado & Southern, and by this route the concentrates are shipped to the Denver smelter. The character of the ore in the upper levels is silver-lead, which at depth in some instances has changed to auriferous copper and iron pyrites.

Leadville has been watching with much interest the action of the senate in regard to the tariff on lead. Several of the properties in this district are low grade and the fact that the tariff has been allowed to remain will enable mining men to carry on operations profitably.

Indianapolis

May 17—State mine inspector Epperson has taken steps to bring all mines in the State, no matter what their size, under the mine laws. At present the laws apply only to mines employing ten or more men, and the smaller mines are allowed to operate as their owners pleases. There are over 400 small or wagon mines in the State, employing anywhere from one to nine men, and some even as high as 15 men, in violation of the law.

Mr. Epperson's plan is to bring all these mines under the State law and he is hopeful of being able to convince the legislature that it is necessary. The regular State inspectors would look after the large mines as at present, and 17 men, appointed in counties where there are wagon mines, would be paid by their own counties. Mr. Epperson says the loss of life in small mines is greater than in large ones and the application of law to them is very necessary.

The Indiana Supreme Court, in the case of Pugh vs. Collins Coal Company has decided that when the information that timbers are needed in a coal mine was actually given by the workmen to the company operating the mine, its failure to supply and deliver to such workmen the needed timbers constitutes a violation of the duty imposed by law on such operator, without regard to the manner or form in which the notice is given.

Salt Lake City

May 13—Last month the big concentrating mill of the Boston Consolidated at Garfield was running at two-thirds capacity, and it is expected that this month it will handle 3000 tons of ore daily, its maximum capacity. The mine workings have been extended to a more or less leached and oxidized surface zone to provide ore that is more amenable to concentration. During April, 10 units of the mill were working and the other two will be put into commission this month.

John D. Ryan, president of the International Smelting and Refining Company, which is building a large smelting plant in Tooele county, visited the smelter site last week. In an interview in Salt Lake City he said: "The smelter will be built as rapidly as possible with an initial capacity of 2000 tons per day. It will be so constructed that the capacity can easily be increased. It will be operated on the usual competitive lines of a customs plant, and when we are able to secure a sufficient volume of ore the character of which is not adapted to the smelter as its original unit is being planned, and which can be treated at a reasonable profit, the works will be added to or altered and adapted to the needs of the case." The latter portion of the remarks quoted is generally understood as indicating the possibility of the International company entering the lead smelting field whenever conditions seem to warrant this step. During his visit Mr. Ryan was for several hours in conference with Jesse Knight, and it was expected that something definite would be released concerning the talked-of deal for the Tintic smelter, the Colorado and Iron Blossom mines. Nothing was announced, however, and the impression is that the matter will receive further consideration before an understanding of any character is reached.

The Murray plant of the American Smelting and Refining Company has resumed operation after a brief shutdown owing to the walkout of the foreign laborers, who were later followed by the American employees. Last week the American workmen decided to return to work. On May 17, one furnace was started and it is expected that the plant will be in normal operation by the end of the current week. Some of the foreign laborers are being reëmployed, but at the same schedule of wages as before the strike.

A plan for the reorganization of Newhouse Mines and Smelters is under consideration, which will result in the holders of the $1,300,000 bonds agreeing to accept for them income bonds convertible into 260,000 shares of new stock at $5 per share, while the holders of the present 600,000 shares of outstanding stock will pay an assessment of $1 per share. Such an arrangement would enable the company to pay off its floating debt and leave upward of $300,000 in the treasury.

Authority has been asked of the courts to re-open the U. S. copper smelter under the system introduced successfully in the lead smelter for restraining the smoke and neutralizing the sulphuric fumes. However, it is expected to be a matter of eight months or so before smelting can be resumed in any event.

Mexico

May 12—The action of a recent popular convention in declaring for the reëlection of President Diaz and Vice-President Corral has cleared the political atmosphere and given reassurance to all business interests, particularly those in which foreign capital is invested. The broad and liberal policy of the president toward foreign investments has been fully evidenced in the past and it is well known that he has experienced no change of policy in this respect. The election will take place in 1910 for a term of six years. Should the president die during that term he will be succeeded, under the constitution, by the vice-president, who presumably now will be Sr. Corral. Business men, generally, feel full confidence in Sr. Corral's ability, progressiveness, and his liberal attitude toward foreign interests. He was formerly governor of Sonora, and has extensive mining interests there. He has been in close touch with the operations of Americans in the republic, and has always shown encouragement to the Americans in their Mexican undertakings. It is known that he joined with the president in the suppression of the anti-foreign, so-called, clauses in the new mining law.

While the low price of silver has held back a good many development enterprises

in Mexico, yet it is probable that the number of tons of silver-bearing ore produced is as great now as ever before, and that the output in ounces for the current year will show an increase over any previous year. Some of the companies find reasonable profit even at the present prices. Others treating low-grade ore, on which operations were installed on the basis of 60c. silver have seen their profits practically wiped out by the fall in the price. They have continued operations and have made desperate attempts to introduce the utmost economy in operation and treatment, and have been successful in reducing costs materially, in many cases much below the engineer's estimates. Most of the companies have been forced to practice unexpected economies in connection with the management and general expense charge. While the percentage of saving with the cyanide plants, which treat a large part of the Mexican silver ore has steadily increased over the first years of operation, it has not generally reached or exceeded the expectations of the engineers or managers. The Mexican silver mines generally carry very little gold, from 5 to 10 gm. of gold to 1 kilo of silver. The little gold with the Mexican silver has proved to be a safety factor during the period of low silver and it is carefully considered now. Formerly, with the patio process, it was largely lost. The production of silver and gold in connection with the copper operations in the Republic is steadily increasing, and promises to become an important factor.

London

May 8—The statutory meeting of the Abbontiakoon Mines, Ltd., a reconstruction of the Abbontiakoon (Wassau) mines and of the Abbontiakoon Block 1, Ltd., West Africa, was held recently. Under the amalgamation scheme the debentures and loans of the Block 1 Company have been paid off. The total number of shares issued to date is 903,876, of a nominal value of 10s. each, and there are 423,654 shares under all. The authorized capital of the company is £700,000 divided into 1,400,000 shares of 10s. each. The ore reserves on April 30 are estimated at 117,000 tons, averaging 13 dwt., over a width of 50 in. With the fresh capital raised by the amalgamation it is proposed to carry on vigorous development work and some alterations are also to be made to the plant. The directors are considering the advisability of shutting down the mill until the ore reserves are increased, anticipating a reduction in costs when working on a larger scale. Having regard to the smallness of the ore reserves and to the large capital that is invested, it is evident that the management has a hard struggle before them to earn fair dividends for the shareholders.

The latest process for the concentration of ores is that known as the Murex magnetic process, the advertisement of which had led to hostile criticism from another company interested in the same line of business, the Ore Concentration Company, owning the Elmore patents. An infringement of patents having been suggested, the Murex company wrote to the Ore Concentration company, saying that it was ready to exhibit its process to a committee of independent experts and to accept their decision whether the new process was an infringement of previous patents or not, each side to put up £1000 to cover expenses. This challenge the Ore Concentration company has so far not accepted. As to the merits of the new process the writer is not yet in a position to express an opinion, and the following information is extracted from an official circular. The Murex magnetic process is a wet process. The mineral particles in an ore are separated out by being made magnetic through the addition of a small percentage of magnetite. The process may be divided into two parts. First, the separation of mineral from gangue, and secondly, the separation of mixed minerals from each other. The ore, after being crushed, is treated with a "magnetic solution," mixed with a small quantity of water and then passed over a single magnet. In the second process the concentrates are again treated with a Murex solution and then passed over ordinary concentrating appliances, whereby the different minerals are separated from one another. All this sounds mysterious, and engineers will want more detailed information as to the nature and properties of the solutions used before accepting the process. In the circular referred to, the assay results, certified by a well known assayer, of the products obtained from a test on a low-grade Broken Hill ore are given, but as the weights are not published, the figures have little value. The Murex magnetic company has erected an experimental plant in London and invites engineers to make their own tests, an invitation which will in no doubt lead to fuller information being shortly published as to its value and novelty.

The Carmen Mines, of El Oro, is a new company starting business with an issue of £120,000 in £1 shares. The company owns claims to the north of the Sirio and El Suceso blocks of the Esperanza, Ltd., at El Oro, Mexico. Development work is to be started from the Carmen shaft, which is to be sunk an additional 300 or 400 ft., "to get through the poor zone and into the level of the sulphide ore, which has been found so rich in the neighboring mines." Perhaps the company may meet with success, but the prospectors fail to make it clear that the Esperanza claims, under which it is going to work, are the poor portion of the property where development work has not so far proved anything of much value. The Esperanza mine proper is a considerable distance away.

Paris

May 12—The Compagnie Française des Gisements Aurifères du Comoé et Affluents sent a 3½-cu.ft. open-connected bucket dredge to Ivory Coast at the end of 1908 to work the deposits it owns on the Comoé river. The pontoon is 82x30 ft. and 6 ft. deep. It is made of timber as well as the gantries. The ladder is designed to dredge at a depth of 24 ft., when inclined at 45 deg. It turns concentrically with the upper tumbler shaft. The revolving screen is about 20 ft. long and 5 ft. in diameter. Gold is to be saved over eight Turner gold-saving tables fitted with cocoanut matting and expanded metal. Stones are rejected by a Robins belt elevator. The dredge is steam driven and equipped with a Babcock & Wilcox boiler of the portable type, having a heating surface of 759 sq.ft. The company reports that, notwithstanding difficulties, transport is proceeding regularly and that it expects that all the material will soon be on the spot ready for erection.

The Société des Forges et Aciéries de Commentry-Fourchambault has just concluded an arrangement with the Campagnac collieries in order to increase its coal reserves. Its iron-ores reserves are insured by its interest in the Joudreville mine (Briey district), by the Muret mine bought from the Aciéries de France and by iron ores in the Pyrénées which form a part of its smelting charges.

The Compagnie du Boléo, at the general meeting held in Paris on April 28 declared a dividend of 150 fr. per share of 500 fr. and of 87.714 fr. per one hundredth part, as against 200 fr. and 124.67 fr. last year; 312.50 fr., 1907, and 212.228 in 1906. The production of copper was 12,470 tons in 1908 against 11,150 in 1907 and 11,000 in 1906. The average tenor of the ore was 3.68 per cent. copper against 3.46 in 1907. The profit was $938,640 against $1,273,429 in 1907. The company has spent some $400,000 in new installations, a third of which was for the harbor. The new furnace fitted with 24 tuyères is giving complete satisfaction and still better results are expected with the 30-tuyère furnaces.

The Société Nouvelle des Minas de la Lucette, the plant of which was lately described briefly in the JOURNAL, has declared a dividend of 40 fr. per share of 100 fr. against 35 fr. in 1907 and 30 fr. in 1906. Profits were $323,592. Sales of antimony ore, regulus and oxide were $273,000 against $525,800 in 1907; and $523,900 worth of gold and concentrates, against $210,000 in 1907 and $62,600 in 1906. The difference in value of antimony products is due almost entirely to the considerable diminution of the price of antimony since 1907. However, the working costs of this enterprise were covered to the extent of 80 per cent. by the sale of the antimony products.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

CHICAGOFF ISLAND

Golden Gate—A tramway and stamp mill are being installed. The machinery has already been shipped from Seattle. A 300-h.p. hydroelectric plant will also be installed by this and the Chicagoff Gold Mining and Milling Company, to be used in common.

Chicagoff Gold—In the main tunnel, 800 ft. long, a rich body of ore was recently opened. It is said that enough ore has been shipped to more than pay for driving the tunnel.

KASAAN BAY

Mt. Andrew—Regular shipments of ore are being made to the Tacoma smelter.

SEWARD

James Dinsmore and Nels Peterson will soon arrive with a large consignment of placer mining machinery.

Alaska Central Railway—A new board of directors was elected in Seattle last week. A contract for 30 miles of road was let to Snow & Watson.

Arizona

GILA COUNTY

Old Dominion—The April production of copper was 2,845,000 pounds.

Arizona Commercial—The Eureka shaft has been unwatered, and work will begin at once on the 600- and 700-ft. levels. The pumps handle 1,500,000 gal. water daily.

Arizona-Michigan—Copper ore was recently encountered at a depth of 325 feet.

Warrior Copper—During the month of April the company shipped to the Old Dominion smelter at Globe, Arizona, 1000 tons of copper ore. Eighty per cent. of this ore was from development work, and the average copper returns were 11 per cent.

GRAHAM COUNTY

Arizona Copper—The copper production for April was 2,686,000 pounds.

YAVAIPAI COUNTY

Arizona Power—The tower line is completed into Jerome, and the work of stringing the copper wire is now going on. The wire camp is now within three miles of this city. Power will be ready to deliver over this line by June 1. The United Verde Copper Company will be a heavy consumer of power.

Grand Island—The work of unwatering the shaft is now completed, and work has been resumed after a short interruption caused by the installation of the new steam hoisting plant.

California

AMADOR COUNTY

Garibaldi Hydraulic—Coarse gold is being taken in good quantities from the sluices before the general cleanup is made. Bedrock has not yet been reached.

INYO COUNTY

Greenwater Copper—A 60-ft. ledge of 5 per cent. copper is reported as being recently crosscut on the 1000-ft. level. The sinking of the shaft is still being carried on to the 1500-ft. level, from whence the same ledge will be cut.

KERN COUNTY

Kern River Mining and Power Company—H. C. Shippee, manager and secretary, states that a large mill is to be erected near Havilah. The mine is on the Kern river near the plant of the Kern River Power Company.

Zenda—McCarthy & Johnson are preparing to reopen the Zenda mine at Amalie.

SHASTA COUNTY

Tarantula—This group of mines in the western part of the county has been placed unber bond to Chas. Kunz. There is a 10-stamp mill on the property and a force of men will soon start work on a large scale. Mr. Kunz is acting for the Stauffer Chemical Company of San Francisco.

Lucky Spot—This company has been incorporated at Anderson with W. C. Barkuloo as president and James E. Isaacs, of Redding, is secretary. The mine is an old placer, near Ingot, which has been idle for years owing to litigation. The courts decided adversely to the Southern Pacific railroad and favorably to the miners, so the mine will now be worked.

SIERRA COUNTY

Cold Spring—At this mine, Mount Vernon, Asa L. Wilson is taking gold from the channel. It is worth at the mint $20.05 per ounce. The gravel will be washed as soon as the water flows.

SIERRA COUNTY

Gravel—F. S. Clark is opening his gravel claims near the Four Hills power house, 16 miles from Downieville. Mr. Clark relocated this ground lately after having left it for 41 years.

SISKIYOU COUNTY

Eastlick—It is expected that this hydraulic property, with its ditches, pipe lines, etc., will be purchased by Gardner & Weed, of Oro Fino.

Corson & Cradle—Newcomb & Cradle have uncovered a rich ore-shoot in this quartz mine at Oro Fino.

TRINITY COUNTY

Birdie M.—In this mine at New River, H. S. Nonemaker, the owner, has opened a 3-ft. ledge running $16 gold and $3 silver per ton.

Trinity Center Gravel—A large acreage of gravel underlying the entire town of Trinity Center is being prospected by drills to see if it is valuable enough for dredging.

TUOLUMNE COUNTY

Gold Spring Cottage Ranch—This prop- between Sonora and Jamestown is being worked as a mine by McLaughlin, Heeseman and Bedig who are to pay Mr. and Mrs. E. J. Doherty $10,000 for it. Work on the property has commenced.

Horseshoe Bend—This property has been conveyed to the Empire Gold Mining Company. Considerable money has been spent on the mine.

Black Oak Mining Company—The mill at this property, Soulsbyville, is now at work on ore found on the seventh level. For over a year past S. A. Knapp and associates have been at work reopening the mine.

App—Ore of "candle box" value has been struck in a drift on the 1300-ft. level. The property is owned by W. A. Nevills. Five stamps are running.

Gold Crater—After four years' work at Knight's creek, J. H. Adams and associates have tapped a good vein at 220 ft. depth.

Sell—This old mine at Sonora has been leased for ten years to S. C. Irving, of Berkeley, who will now develop it on a large scale.

Colorado

BOULDER COUNTY

United States Gold Corporation—Arrangements have been made by Secretary John R. Wolf, of Boulder, to build a mill of 150-tons capacity which will handle the ores of the company at Sugar Loaf as well as custom ores.

John Jay—This property at Jamestown,

now controlled by J. A. Reynolds, of Chicago, Ill., will be equipped with a cyanide plant for the handling of the low-grade ores. About 200 tons of high-grade smelting ores were recently shipped.

Vancleuse—This company has purchased the Yellow Pine mine at Crisman, near Sugar Loaf and will install machinery. Rufus C. Wood, Boulder, Colo., is manager.

Bailey Mill—John H. Kemp, of Boulder, Colo., who has been in the East to finance this property, has written that arrangements have been completed for the remodeling of the mill and making its initial capacity 50 tons per day. The mill is located in the Eldora district.

CLEAR CREEK COUNTY

Allen Group—Texas men have become interested in this group of 17 claims in the Cascade district and the property will be developed through the Burns-Moore tunnel.

Banner Consolidated—A large amount of development work has been outlined by Manager Fred H. Nye, of Idaho Springs, and it is the intention of the company to take out the product through the Rockford tunnel on Clear creek, where a mill is to be built.

Geneva Extension—Fort Worth, Texas, capital has become interested in the Star group in the Peru district, and liberal development will be carried out.

Empire Tunnel Company—This company will install a new system of ore dressing, and it is said that the company controlling the Michaelson patents have made a proposal to take a 10-year lease on the property and erect a 200-ton plant. The property is at Empire, Colo.

Dorit—Extensive operations are to be carried on through the Peters tunnel, including the installation of an electric-power plant, also the future erection of a 100-ton plant for treating ores. William Broad, Idaho Springs, Colo., is manager.

Silver Horn—Robert McLean, of Idaho Springs, has opened a high-grade vein in the adit of this property.

Alice Gold Mines Corporation—Plans are well under way for the erection of the 300-ton plant for handling the low-grade bodies of the Alice mine in the upper Fall River district. Several buildings are now being erected for the use of the men and with fine weather the construction work will be rushed. A. H. Roller and W. L. Shaffer, Idaho Springs, are in charge.

GILPIN COUNTY

North Gilpin—Denver and Eastern men have become interested in a group of claims in Moon gulch and will install machinery. J. S. Fagrelius, Rollinsville, Colo., is manager.

East Boston—The property of this company situated in the Central City district was sold at trustees' sale and was bid in by Amos F. Adams, of Boston, Mass., for the sum of $22,686.

Senator—This company contemplates the installation of an air compressor for driving the tunnel. M. J. Ryan, Central City, Colo., is superintendent.

Idaho

SHOSHONE COUNTY

According to reports filed with the county assessor, the net profits of the principal mines in the Cœur d'Alene district, for 1908, were as follows: Bunker Hill & Sullivan, $901,721; Hercules, $383,752; Hecla, $108,799; Standard, $693,124; Last Chance, $221,610; Morning, $16,855; Snowstorm, $162,149. The Tiger-Poorman shows a loss of $41,860.

Indiana

BARTHOLOMEW COUNTY

The coal deposit found on the Ott farm, near Lowell, is creating considerable interest. Investigation is said to have proved the existence of a vein of coal 8 ft. thick. This is the first coal discovered in this territory and development will be pushed.

CLAY COUNTY

Treager Coal Mining Company—This is the name of a new organization incorporated during the week. The company is well financed to carry out its declared purpose of carrying on the business of mining for coal, clay and shale. William F. Treager, John H. McLaughlin and Samuel R. Treager, directors.

GREENE COUNTY

Miners in the Jasonville district are encouraged over the outlook for steady work at the mines this summer. The selling of the Walsh property they regard as a good omen, since the new company has already begun to make arrangements to start the idle mines.

PIKE COUNTY

Pike County Coal Company—This company, with headquarters in Huntingburg, which has been operating the Winslow mines, has ceased operation.

SULLIVAN COUNTY

On May 11, $100,000 was paid out in wages to the miners in this district. It was the largest amount that has been paid at any one pay day in this county for the past 10 months.

Keystone Mine—A fire was started from a windy shot May 11, and continued to burn for five days. The fire was in the part where there was a large area of old workings, and the draft was such that men could not approach within 100 ft. of the blaze. Sixteen men fought the fire at a time, shifts being changed frequently. These attempts proved futile and the Pittsburg and the Urbana rescue stations were appealed to for assistance. The rescue men brought with them oxygen helmets and were able to get quite close to the fire and began playing on it with two streams from hose.

VANDERBURG COUNTY

Ohio Valley Coal Company—The mine, near Evansville, started May 12 and several hundred miners were given work. The mine had been closed for several weeks because of slack demand for coal.

VERMILLION COUNTY

The total payroll for the miners of the Clinton field for the past two weeks amounted to $70,000. The recent change in the control of the Dering mines, which have been leased by the Brazil Block Company, has been followed by better work at the mines of that company.

VIGO COUNTY

Vandalia Mining Company—A controversy has started with the officials of the United Mine Workers over the demand of the men that they be permitted to remove the top coal at mine No. 65 east of Terre Haute. When the company ordered that coal be left at the top, the mine committee ordered the men to quit work, and the superintendent in turn discharged the committee. The company contends that the coal must be left as a support to the roof of the mine; that the State mine inspectors has served notice that it must not be removed. The miners say they have a right to mine all the coal of the vein, and if any is left they are entitled to extra pay.

Maryland

Consolidation Coal Company—It is announced that arrangements have been completed for merging in this company the Fairmont Coal Company, the Somerset Coal Company, the Clarksburg Fuel Company, the Pittsburg & Fairmont Fuel Company and their subsidiaries, including railroads, floating equipment, docks and other property owned. The companies own about 200,000 acres of coal lands in Maryland, Pennsylvania, West Virginia and Kentucky. Their combined capital stock is $37,600,000, but it is not stated what amount of new stock will be issued to complete the merger. No important change in management is involved; the Consolidation Coal Company—which is the oldest and largest company in the Cumberland, or George's Creek basin, and which owns the Cumberland & Pennsylvania railroad—has held controlling interests in the other companies named for some time. The merger will place the entire property under one head and simplify the management and accounts.

Michigan

COPPER

Michigan—This company has opened up the crosscut that was extended from "C" shaft several years ago to cut the lode recently opened in the old adit working on

the Bee tract. The lode at this point was practically void of copper and nothing further was done at the time, but owing to the exceptional good showing on the Bee tract it was decided to drift on the formation from this point.

Oneca—Diamond drill work is in progress in view of opening the same formation that was revealed on the lands of the New Baltic Exploration Company. This lode traverses the entire tract of the Oneca.

Mass—This company is operating two drills in drifting on the new lode recently opened by the crosscut from the 17th level.

Winona—All activities are centered at No. 4 shaft, blocking out stoping ground. Operations at No. 3 shaft have been temporarily suspended as sufficient ground has been blocked out to supply a stamp head for several years. This company contemplates the erection of a stamp mill in conjunction with the King Phillips property. Plans and a site have been selected. As soon as this is completed, production can go forward from these two shafts without interruption.

Quincy—Sinking is going forward at the No. 9 shaft and a depth of about 400 ft. has been obtained. Copper indications are appearing from time to time, but it is not expected commercial values will be encountered before the 2000-ft. level has been reached. The company is operating four producing shafts, Nos. 2, 6, 7 and 8, and shipping about 4000 tons of rock daily to the mill.

New Baltic—This company is operating a core drill on its lands and has a hole down about 150 ft. A core has been taken out showing some copper.

Wyandote—This company continues driving the crosscut from the bottom of its exploratory shaft, a distance of 700 ft. from surface. Several copper bearing formations have been cut.

Ojibway—The No. 2 shaft has reached the lode by means of the crosscut from the 800-ft. level, about 60 ft. from the shaft and found it well charged with copper. This is what is known as the footwall bed and when opened in the level above carried practically no copper. No. 1 shaft has also cut this bed in the station at the same level. Sinking has been temporarily suspended in both shafts while crosscutting is underway.

IRON—MARQUETTE RANGE

Empire—At this mine, in the Cascade district, the working force has been increased, and shipments will be pushed.

Richmond—Work has been resumed and 100 men are now employed.

Volunteer—Diamond drilling is in progress. The property was recently bought by Thomas F. Cole and others from the Alger estate.

Minnesota

A test case is to be made in a suit to be brought by the attorney-general of the State, under the law recently passed, which declares that the State is the owner of all ore beneath meandered lake beds. Lake beds, whether farm land, ore land or something else, belong to the owners of the land around them, known as the riparian owners, unless the State declares its ownership, and even then there is some question of the validity of such a law. This suit will be brought against the operators of the Long Year Lake mine on the Mesabi. They have not only stripped the land between the meander line and the water line, but test pits have been made in the water and in some places ore has been found under the lake. The right to mine this ore will be tested.

IRON—CUYUNA RANGE

The new Cuyuna Range Railroad Company is making contracts to carry iron ore, in which it is agreed that the railroad shall be finished by June 1, 1910. The road will connect with the Minneapolis, St. Paul & Sault Ste. Marie railroad.

Rogers-Brown Ore Company—A four-compartment shaft is being sunk near Dearfield, in the Rabbit Lake district. Some ore has already been taken out.

IRON—MESABI RANGE

Good progress is being made with the extension of the Great Northern railroad from Nashwauk, and it is expected that trains will be running in August.

Crosby—Shipments are being made from this mine, near Nashwauk, owned by the Cleveland Cliffs Iron Company.

Leetonia—The Jones & Laughlin Company has begun shipments from this mine near Hibbing.

Pearson—This mine, near Nashwauk, is shipping this season for the first time. Development is still going on. The mine is owned by Joseph Sellwood.

Higgins—This mine, at Virginia, has been started up. It is a Steel Corporation property, and was not worked last year.

Mahoning—This mine, near Hibbing, was one of the first shippers on the range this year. It is expected to send out about 1,000,000 tons for the season.

Morton—The sinking of the concrete shaft at Tod, Stambaugh & Co.'s new Morton mine, at Carson lake, two miles southwest of Hibbing, is making satisfactory progress. A depth of 150 ft. has been attained. The ledge which caps the orebody will be encountered at a depth of, approximately, 190 ft., after which the shaft will be firmly anchored in the rock and the work of development will be undertaken.

Silver—M. A. Hanna & Co. are putting down a new spur to the railroad at Virginia, with a view to shipping largely this season.

Missouri

JOPLIN ZINC-LEAD DISTRICT

Alladin—Fire destroyed the mill on the St. Paul ground at Spring City. A new mill will be built. Don McRuer is manager.

Continental Zinc Company—This company is making a splendid run for the first month after production has been resumed. Mules have been put in the mine to haul the cars and the steam shovel has been discontinued.

J. Wooley—A new 100-ton mill has been completed on the American land east of Joplin, near the old Dividend, and is ready for production.

Montana

BUTTE DISTRICT

Davis-Daly—The company is expending about $30,000 monthly on development work. Negotiations are pending for contracts with the Amalgamated interests whereby ore may be shipped to the Washoe or Great Falls smelters for treatment. It is possible that the smelter of the Basin Reduction Company may be used in the event that satisfactory contracts with the Amalgamated cannot be made.

Butte & Superior—A strike of copper ore has recently been made on the west drift on the 1400-ft. level. The grade and extent of the lead cannot be determined until further development work is done.

Butte & Milwaukee—It is reported that operations will be resumed shortly. The property lies immediately north of the Butte & Superior ground.

FERGUS COUNTY

Cumberland Mine—The mine is producing steadily under the direction of A. S. Wright, who has a lease on the property. A short time ago a shipment of 28 tons of gold ore was made which netted $250 per ton.

GRANITE COUNTY

Bimetallic—Work has been begun on the company's new cyanide plant at Phillipsburg. Five 100-ton concrete tanks will be built. President Fusz, of the company, has arrived from St. Louis and will attend the annual meeting of stockholders to be held in June.

MISSOULA COUNTY

Black Traveller Mining Company—The property is a copper prospect and is situated near Saltese. A tunnel is now in a distance of 1050 feet.

Nevada

ESMERALDA COUNTY—RAWHIDE

Mint Lease—The shaft is in good ore at the 320-ft. level, and three shifts are employed.

Marigold Lease—High-grade ore ship-

ments are made every week. The rich streak still continues on the 160-ft. level.

Grutt Ballon—This lease, which is considered the best in the camp, is shipping regularly to the sampler at Hazen, Nev. The ore will average $300 to the ton.

Prosky No. 1—This lease has rich gold ore on the 100-ft. level, and is shipping high-grade ore to the mill.

Kaufman Lease—A 4-in. vein of high-grade gold ore was recently struck on the 100-ft. level and is now being sacked for shipment. This is reported to be one of the richest stringers ever struck in the camp.

Black Eagle—A new 6-h.p. hoist has been erected on this property in the western part of the district. The mine is being investigated by an Eastern firm with the view of purchasing.

King-Heisner—It is expected that the cyanide mill will be ready for operation by June 25. The mill will have a complete sampler.

ESMERALDA COUNTY—HAWTHORN

Lucky Boy—It is reported that the United States Smelting, Refining and Mining Company has an option on this silver-lead property. One hundred and thirty men are employed.

ESMERALDA COUNTY—LUNNING

Taft—This group of copper claims is now being examined by Boston people, with a view of purchasing.

New York

ESSEX COUNTY

The usual yearly report of the discovery of gold in the Adirondack region has come; this time from the neighborhood of Lake Placid, where it is said a prospector has found a vein, specimens of which assay very high in gold. It is not likely that this will amount to more than previous "discoveries" of the same sort.

North Carolina

RANDOLPH COUNTY

Ashboro Gold—A charter was recently granted the Ashboro Gold Mining Company, of Asheville. The capital stock is $50,000. Incorporators, W. W. Taylor, of Chicago; W. P. Johnson, of Philadelphia, and J. T. Winslow, of Ashboro.

ROWAN COUNTY

Union—Under the management of Walter George Newman, this mine is producing gold bullion steadily from the 20-stamp mill.

Granite Quarry—Secretary of State has granted a charter for the amalgamation of the Balfour Pink Granite Company, the Rowan Granite Company and the American Stone Company. Capital of the new company is $1,250,000 paid in. Over 2000 men will be employed. The quarries are three miles from Salisbury. Branch offices will be established in New York, Philadelphia, Toronto and other important centers.

Oklahoma

OTTAWA COUNTY

Miami Zinc District—The Wauhillan mill has been completed and is ready for production. The Little Maxine is erecting a mill. The Last Chance and Blue Bell have contracted for mills.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—This company's statement for March and nine months of its fiscal year from July 1 to March 31 is as follows:

	March.	Nine Mos.
Earnings	$2,855,541	$25,658,967
Expenses	2,591,997	24,234,153
Net earnings	$ 263,544	$1,424,814

For the nine months there were decreases of $2,748,896 in earnings, of $2,116,150 in expenses, and of $632,746 in net earnings, as compared with last year.

BITUMINOUS COAL

Pittsburg Coal Company—This company's fiscal statement for the three months ended March 31 is as follows:

	1908.	1909.	Changes.
Net earnings	$ 515,993	$ 429,199	D. $ 86,794
Charges	641,381	594,652	D. 46,729
Surplus	$ 125,388	$ 165,453	I. $ 40,065

The charges this year were $106,998 for depreciation of coal lands; $231,967 for depreciation of plant and equipment; $255,687 for interest on.

South Carolina

YORK COUNTY

Darwin—At this property the Cripple River Hydraulic Company, of New York is sinking a 100-ft. shaft in order to exploit a vein at that depth which has produced good ore from the surface.

South Dakota

LAWRENCE COUNTY

Imperial Mining Company—The miners are engaged in sinking through the porphyry which blocked drifting in the quartzite level of the Dakota shaft. It was first supposed to be a dike, but turned out to be faulted porphyry capping. The shaft has gone down 80 ft., passed through the porphyry, and is now in shale, probably close to quartzite.

Nebraska—A strike of good milling ore is reported on the Connie-May-Morris ground, near Roubaix, which is being worked under lease by the Nebraska Mining Company.

PENNINGTON COUNTY

Forest City—This company, operating the Clara Belle mine, near Hill City, has begun the erection of a cyanide plant to treat the tailings from the amalgamation mill. The recovery by amalgamation is about 50 per cent.

Mariposa Mining Company—This company is about to begin the erection of a hoist on the property at the head of Burnt Fork creek. The shaft, which is down 200 ft., will be sunk another 100 ft. Later a 100-ton mill is projected on Slate creek southeast of Mystic.

Texas

MARION COUNTY

Jefferson Iron Company—This company has bought the property of the Lone Star Iron Company at Jefferson, and is negotiating for the purchase of several large tracts of land containing iron-ore deposits. The headquarters of the company are in St. Louis; the officers are A. P. DeCamp, president; N. P. Withington, secretary and treasurer.

TARRANT COUNTY

American Fullers' Earth Company—Preparations are being made to increase the plant from 20 tons to 50 tons daily capacity. The company has a lease covering 2500 acres of land near Fort Worth.

Utah

BEAVER COUNTY

Utah Gold and Copper—A force of men is now finishing the laying of a 2000-ft. line of 6-in. pipe for carrying water to the mouth of the tunnel. This will be used to develop power for blowers for ventilating the mines, and also for operating an electric-light plant. Lumber for bunk houses, office and blacksmith shop is being hauled from Modena. The buildings will be completed in about three weeks. Ore shipments will be increased in the near future.

Orphan Boy—W. J. Merritt and associates have taken control of the Orphan Boy property in the Star district consisting of 11 claims. At present there are about 1200 ft. of tunnel and 500 ft. of shaft. It is the intention of the new company to commence work on a double compartment shaft to be sunk to the 1000-ft. level.

Golden Reef—This company with properties at Beaver Lake recently listed its shares on the Salt Lake exchange. The company is capitalized for $100,000, represented by 500,000 shares of stock of par value of 20c. The property consists of 27 claims surveyed for patent, and the development consists of 500 ft. of shafts, 1900 ft. of tunnels and 60 ft. of winzes. The shaft is equipped with a 15-h.p. gasolene hoist and 10 men are employed at the present time.

JUAB COUNTY

Swansea Extension—In the north drift on the 200-ft. level below the tunnel disclosures have been made of fine lead ore. The ore body is about 300 ft. below the surface.

Tintic Mines Company—The officers have ordered the 135-ft. shaft on the Town View claim to be retimbered and deepened. The movements of this company have been watched with considerable interest since the purchase of several claims north of the Victoria and east of the Eagle & Blue Bell.

SALT LAKE COUNTY

Butler-Liberal—A new compressor is being installed and as soon as it is in working order the shaft will be deepened to get under the orebody opened up some months ago on the 227-ft. level. The company has at this level a breast of 14 ft. of good ore.

Columbus Consolidated—Two new 2½-ton electric motors have been placed in commission in the main operating tunnel. These motors run from power derived from storage batteries which are charged from the company's hydro-electric plant. Each motor is capable of handling 12 cars of ore. The foundations are ready to receive the new electric station pump, which is now *en route*. A new strike has been made on 300 level in the Garfield fissure.

SEVIER COUNTY

Sevier Consolidated—It was reported that the right vein that the former owners of the Sevier Consolidated had lost through faulting has been recovered. The vein was faulted to the west with its dip reversed. A crosscut to the west on the 85-ft. level has caught the vein.

TOOELE COUNTY

Consolidated Mercur—Owing to failure of the ground under part of the leaching department of the cyanide mill, eight large leaching tanks collapsed precipitating their contents on the floor of the mill. There was no loss of life the unloading crew being in another part of the mill at the time of the accident. Reserve tanks were put into use and the capacity of the mill will not be seriously curtailed.

Virginia

FLOYD COUNTY

Work has been resumed at the arsenic mines in this county, after a shutdown of several years.

Washington

JEFFERSON COUNTY

James A. Moore, of Seattle and associates are installing a steel plant at Irondale to be completed within six months. Mr. Moore has control of large deposits of hematite ore in Washington.

WHATCOM COUNTY

International Lime Company—The company has purchased 160 acres of land containing raw material for the manufacture of cement. It is reported that a plant will be built soon.

Wisconsin

IRON—GOGEBIC RANGE

A syndicate having its headquarters at Ironwood, Mich., has bought a 40-acre tract north of the Ottawa and Windsor mines, and has begun to test it by drilling.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore from Cobalt camp for the week ending May 8 were: Coniagas, 65,400 lb.; Crown Reserve, 102,816; Kerr Lake, 122,201; La Rose, 327,300; Nipissing, 337,090; Temiskaming, 150,060; Temiskaming & Hudson Bay, 60,000; total, 1,164,867 pounds.

Little Nipissing—A new hoist and boiler are being installed on the company's location J. B. 2, the shaft on which will soon be down to the 125-ft. level, where drifting will be carried on. A new vein 16 in. wide of vein matter carrying 2 in. of cobalt is reported to have been struck about 4 ft. from the main vein on the company's Peterson Lake lease.

Muggley Concentrators, Ltd.—From April 19 the name of this company has been changed to Northern Customs Concentrators, Ltd.

Ophir—A plant consisting of a 100-h.p. boiler and six-drill Sullivan compressor is being installed. No. 1 vein has been traced by stripping for 1300 ft., and on the surface shows native silver and nicolite. There are five other promising veins on the property.

Pan Silver—On this property, adjacent to the Temiskaming, six shafts have been sunk. The deepest is the main or No. 4 shaft, down 180 ft., from which 380 ft. of drifting has been done at the 100-ft. level, and a vein carrying native silver encountered. The shaft is being put down to 200 ft Shaft No. 5 is down 60 ft., and drifting was recently started at that level on a 7-in. cobalt-calcite vein showing native silver contents. Development work is at present confined to these shafts, and diamond drilling is being carried on at the south end of the property to pick up some of the Gifford Extension veins.

ONTARIO—MONTREAL RIVER DISTRICT

Elk Lake—This company, controlled by the Hawthorne syndicate, is installing a plant, comprising a five-drill compressor, two 60-h.p. boilers and a hoisting engine.

Otisse—Work is steadily progressing and a large quantity of ore has been sacked ready for shipment on the opening of navigation.

YUKON

An important strike of paying gravel was made recently on Miller creek, in the Glacier creek district. The strike is on ground that is open to entry, and a number of miners and prospectors have gone to the district.

Another strike, which has caused much excitement is on Hubbard creek in the Fortymile district. This is reported to be rich.

Mexico

SONORA

Black Mountain—Oil is to be used for fuel in place of coal. About 250 men are employed. Chief Engineer S. E. Powers was killed recently by falling into a concrete oil pit.

El Globo—Work is being pushed by means of a small air drill on the 1600-ft. prospect tunnel which is calculated to cut the vein at a depth of 1000 ft. C. A. Romadka, of Douglas, Ariz., is general manager.

El Van Mining Company—One thousand feet of development work have been done on the property near Nacozari. A large body of concentrating copper ore was encountered; also a body of 10 per cent. ore. Fritz Kohlmeyer is manager.

Pavo Rico—This mine, owned by N. S. Finch, is under option to O. L. Neer and Geo. B. Hosier, who have a small force of men at work, and have a shipment of ore ready for the smelter.

Promontorio—C. B. Dunster recently made an examination for Michigan parties. The mine is a short distance below Moctezuma.

Pura Plata—The mine about 15 miles west of Moctezuma, has been secured on a $30,000 bond and lease from Geo. F. Woodward and associates. W. P. Belding, of Los Angeles, the new owner, will start work on the property at once.

Silver Seal Exploration Company—Three cars of high-grade gold-silver-copper ore are being shipped to Douglas. The ore is maintaining its silver and copper value, with an increase in the gold contents. Dr. A. Sandberg, of Nacozari, is superintendent.

Lucky Tiger—The directors' report, March 17, 1909, states that for the year ending Dec. 31, 1908, the total prospecting and development work in drifts, raises and crosscuts was 10,230 ft. The mine produced 2014 tons of first-class ore, yielding $471,425, and 1426 tons of concentrates, worth $339,963. Net returns from smelters $713,297. Dividends paid during the year, $71,500.

Australia

NEW SOUTH WALES

Gold production in April is reported at 21,360 oz., an increase of 626 oz. over April, 1908. For the four months ended April 30 a total of 77,112 oz. is reported this year.

WESTERN AUSTRALIA

Gold production in April was 137,764 oz., being 10,770 oz. more than in March, but 7951 oz. less than April, 1907. For the four months ended April 30 the total production was 556,356 oz. in 1908, and 520,141 oz.—or $10,751,314—in 1909; a decrease of 36,215 oz. this year.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, May 19—The coal trade in the West, while still subject to fluctuations, seems to be approaching more solid ground. The steady, if slow, increase in the demand for steam coal is making itself felt and the trade is more active than at any time during the past 18 months. It has not yet approached anything like a boom stage, but has advanced considerably beyond its period of greatest depression. The Lake trade opens rather slowly.

In the East the bituminous trade remains more quiet than in the West, but the time is approaching when Seaboard consumers must lay in stocks, and sellers are rather encouraged; though trade is not yet active a better feeling is manifested.

The anthracite trade is quiet and will probably remain so until accumulated stocks are worked off. This will take some time and the larger companies are running many of their collieries on short time. It is probable that May will show a lighter production of anthracite than any month this year—certainly less than in March and April.

The report that the controlling interest in the Chesapeake & Ohio road had been sold to the Pennsylvania Railroad Company seems to have been premature, since it has been contradicted. The present owners of the road announce that they are negotiating for new connections and extensions, but it is quite possible that this is only intended to promote the sale which is evidently desired. Meantime it is to be noticed that the pushing of West Virginia coal in the Seaboard markets is less aggressive than it has been.

Tidewater Coal Demurrages—Charges have been filed with the Interstate Commerce commission by Peale, Peacock & Kerr, shippers of bituminous coal from central Pennsylvania, against several of the carrying roads. The complainants claim that demurrage and other charges are levied at tidewater points which, in effect, discriminate against the smaller independent shippers.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to May 8, short tons:

	1908.	1909.	Changes.
Anthracite	1,927,189	1,888,727	D. 38,462
Bituminous	11,415,858	12,351,856	I. 935,998
Coke	2,447,380	3,497,590	I. 1,050,210
Total	15,790,427	17,738,173	I. 1,947,746

Increase for the week, 157,788 tons. The total increase this year to date was 12.3 per cent.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, three months ended March 31, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio	4,780,391	990,562	5,770,953
Buff., Roch. & Pitts.	1,402,009	109,839	1,511,848
Buff. & Susqueh'na	397,719	81,738	479,457
Penn. lines, N. Y. C.	1,971,559	22,092	1,993,651
Pitts. & L. Erie	1,618,669	1,006,246	2,624,915
Norfolk & Western	2,830,534	644,599	3,475,133
Ches. & Ohio	2,860,329	116,288	2,976,617
Total	15,861,210	2,971,364	18,832,574
Total, 1908	15,502,068	1,951,291	17,453,359

Total increase, 1,397,215 tons, or 8 per cent. In addition the Baltimore & Ohio carried 212,109 tons anthracite in 1908 and 242,249 in 1909; increase, 30,140 tons.

Tonnage of Chesapeake & Ohio, nine months July 1-March 31, short tons:

	Coal.	Coke.	Total.
New River	4,841,857	192,349	5,034,206
Kanawha	3,801,186	21,886	3,823,072
Kentucky	264,634	.....	264,634
Connecting lines	189,055	61,442	250,497
Total	9,096,732	275,677	9,372,409
Total 1907-08	8,358,000	274,049	8,632,049

Total increase, 740,369 tons, or 8.6 per cent. Deliveries this year to points west of mines, 4,701,558 tons coal and 158,268 coke; points east, 1,157,041 tons coal and 117,409 coke; tidewater, 3,231,896 tons coal; anthracite to line points, 6237 tons.

Coal tonnage of railroads in Ohio Coal Traffic Association, three months ended March 31, short tons:

	1908.	1909.	Changes.
Hocking Valley	718,188	696,681	D. 21,507
Toledo & Ohio Cent.	291,426	261,848	D. 29,578
Baltimore & Ohio	518,439	267,240	D. 251,199
Wheeling & L. Erie	738,313	665,852	D. 72,461
Cleve., Lorain & Wh.	700,582	446,978	D. 253,604
Zanesville & Western	363,072	285,300	D. 77,772
Toledo Div., Pen. Co.	525,367	451,278	D. 74,089
L. Erie, Alliance & Wh.	312,338	266,923	D. 45,415
Marietta, Col. & Clev.	21,887	14,321	D. 7,566
Total	4,189,612	3,356,421	D. 833,191

The total decrease in shipments this year was 19.9 per cent.

Coastwise shipments of coal from chief Atlantic ports, three months ended March 31, long tons:

	Anthracite.	Bitum.	Total.	PerCt.
New York	3,900,458	2,471,838	6,372,296	64.7
Philadelphia	472,888	1,043,303	1,516,191	15.4
Baltimore	39,567	852,595	892,162	9.1
Newp't News	.....	651,915	651,915	6.6
Norfolk	.....	415,889	415,889	4.2
Total	4,412,913	5,435,540	9,848,453	100.0
Total, 1908.	3,909,051	5,386,406	9,295,557	.....

Total increase this year, 552,896 tons, or 5.9 per cent. New York includes all the harbor shipping ports.

Coal receipts at St. Louis three months ended March 31 were 2,251,497 short tons in 1908, and 1,774,835 in 1909; decrease, 476,662 tons.

Coal passing through Lock No. 3 on the Monongahela river three months ended March 31 was 2,246,240 short tons in 1908, and 2,371,240 in 1909; increase, 125,000 tons.

Coal passing through Davis Island dam on the Ohio river three months ended March 31 was 841,555 short tons in 1908, and 1,335,445 in 1909; increase, 493,890 tons.

Shipments of coal by water from Seattle and Tacoma, Wash., three months ended March 31 were 163,021 tons in 1908, and 63,662 in 1909; decrease, 99,359 tons. These shipments are chiefly to California and Alaska ports.

Coal passing through the Sault Ste. Marie canals for the season to April 30 short tons:

	1908.	1909.	Changes.
Anthracite	2,032	18,515	I. 16,483
Bituminous	12,648	108,969	I. 96,321
Total	14,680	127,484	I. 113,804

The United States canal at the Sault was opened April 20, and the Canadian canal April 21, about the same dates as last year.

Coal receipts at Boston, four months ended April 30, reported by Chamber of Commerce:

	1908.	1909.	Changes.
Anthracite	540,180	556,101	I. 15,921
Bituminous	1,038,936	1,067,693	I. 28,757
Total domestic	1,579,116	1,623,794	I. 44,678
Foreign	175,450	95,985	D. 79,465
Total	1,754,566	1,719,779	D. 34,787

The foreign coal is chiefly from the Nova Scotia mines.

New York

Anthracite

May 19—Trade is dull and the general anticipation is that it will remain so for a while until the present stocks are worked off.

Prices on domestic sizes are $4.35 for lump and $4.60 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes current quotations are $3.10@3.25 for pea, $2.35@2.50 for buckwheat, $1.70@2 for rice, $1.25@1.50 for barley, f.o.b. New York harbor.

Bituminous

The Seaboard trade is said to be improving, but it is so slow that sharp eyes are required to see the change. If anything, more orders are coming from the far East, while business along the Sound continues regular though of small proportions. New York harbor shows no improvement. Prices are unchanged and their is no surplus coal to speak of, ship-

pers adhering to the plan of forwarding coal to tidewater only on orders. All-rail trade is the best. Transportation and car supply continue good. Some coal is still being taken for outside shipment.

The Coastwise trade continues rather dull and vessels are in good supply. Rates are unchanged. For large vessels from Philadelphia they are: To Boston, Salem and Portland, 55c.; Portsmouth, 70c.; Lynn, Newburyport and Bangor, 75c.; Providence, New Bedford and the Sound, 55c. per ton.

Birmingham

May 17—The coal trade in Alabama is still dull and the production is at low-water mark. In the Alabama coalfields the miners' union is now practically inactive, the few companies recognizing the union not giving employment to a sufficient number of men to warrant any boasting by the organization. There is a probability that no convention of the union will be held this year; in fact the officers of the union have no statement to make that is hopeful. There is considerable activity in coke in this State.

Chicago

May 17—Steam coals continue in steady, though not yet large demand, with lump becoming hard to sell and screenings in better demand. The interest of the trade now centers largely in contract making, prices in which are very low. The Illinois and Indiana supply is well regulated; except for occasional cargoes of lump coal there is practically no demurrage trouble. The domestic trade is fast settling into a state of summer dullness.

Lump and egg from Illinois and Indiana bring $1.75@2.25; run-of-mine $1.65@1.75, and screenings, $1.35@1.65.

Hocking continues in large supply and has some sales at forced low prices to escape demurrage, quotations being $2.85@3. Smokeless continues in well-regulated supply, but has somewhat light sales, lump bringing $3.20@3.45 and run-of-mine $2.95@3.15.

Anthracite sales are somewhat light, but the general volume of business exceeds the record of previous spring seasons so far.

Cleveland

May 18—Lake trade is slow. There has been some chartering, but small vessels are scarce, and are asking a higher figure. Big boats will only go to the ore ports, where quick discharge can be had. The strike makes little trouble so far as the boats are concerned.

Steam trade does not improve as fast as expected. Ohio coal sells at $1.25 for lump, $1 for run-of-mine and 75c. for slack, all at mine, Middle District. No. 8 District coal can be had at $1.10 for lump, 85c. for run-of-mine and 60c. for slack, all at mine.

Indianapolis

May 17—Irregularity still characterizes the coal-mining industry of this State. The first week in May usually affords an index for the summer's work, and the record offers some encouragement. The operators say that the demand for coal is increasing gradually, but admit that when mine-run coal is down to 85c. a ton they can make little, if any, profit.

The United Fourth Vein Coal Company, in the Linton district, has landed sufficient orders to keep the mines fairly busy all summer. All the mines of the Vandalia Company are working now and the company is well fixed for the summer. The Shirley, the Little Giant and the Summit Mining companies report fairly good prospects of steady operation.

The operators are somewhat exercised over the apparent purpose of the Steel Trust to secure control in the Indiana coalfields. The Clinton field, where the Illinois Steel Company has secured a large interest, lies between the Deering property on the north and the Walsh mines on the south. It is considered very probable that Steel Corporation interests will secure control of one or both of these properties.

Pittsburg

May 18—Lake shipments are improving a little, but not to any great degree, though mines are getting ready for the trade. The local trade improves slowly. Prices are low, and in this respect the market does not gain. The outside price for mine-run is $1.10 for ordinary lots, and $1 has been done on large quantities. About 55@65c. may be quoted for slack.

Connellsville Coke—Negotiations for the proposed merger of independents continue quietly, and appraisals are being made of several of the plants.

Standard furnace coke is held at about $1.60 for spot, with $1.75@1.90 on second-half contracts. Foundry is $1.85 @1.90, with $2@2.75 asked on contracts. The *Courier* reports production in both Connellsville regions at 244,279 tons for the week, an increase of 14,572 tons over the previous week.

Foreign Coal Trade

German Coal Production—Coal production of the German Empire, three months ended March 31, metric tons:

	1908.	1909.	Changes.
Coal	37,697,874	36,477,870	D. 1,220,004
Brown coal	16,604,727	16,815,920	I. 211,193
Total mined	54,302,601	53,293,790	D. 1,008,811
Coke made	5,471,331	5,243,737	D. 227,594
Briquets made	4,419,351	4,506,769	I. 87,416

Of the briquets reported this year 3,575,083 tons were made from brown coal, or lignite.

German Coal Trade—Imports and exports of fuel in Germany, three months ended March 31, metric tons:

Imports:	1908.	1909.	Changes.
Coal	2,351,949	1,982,157	D. 369,792
Brown coal	2,201,737	1,801,163	D. 400,574
Coke	130,790	151,349	I. 20,559
Briquets	48,816	45,982	D. 2,834
Exports:			
Coal	4,929,200	5,241,817	I. 312,617
Brown coal	6,068	7,326	I. 1,258
Coke	926,791	835,076	D. 91,715
Briquets	350,401	330,533	D. 19,868

Coke exports this year included 7908 tons to the United States.

Nova Scotia coal shipments, three months ended March 31, long tons:

Companies:	1908.	1909.	Changes.
Dominion	368,713	598,961	I. 230,248
Nova Scotia Steel	81,247	117,737	I. 36,490
Cumberland	89,920	110,071	I. 20,151
Acadia	57,867	79,887	I. 22,020
Inverness	26,412	45,674	I. 19,262
Intercolonial	60,911	68,125	I. 7,214
Total	685,070	1,020,455	I. 335,385

All the companies showed gains this year, the total increase being 49 per cent.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on May 1: Best Welsh steam, $4.02; seconds, $3.84; thirds, $3.60; dry coals, $3.78; best Monmouthshire, $3.60; seconds, $3.42; best small steam, $2.76; seconds, $2.52. All f.o.b. shipping port. This is a farther advance on several kinds.

Iron Trade Review

New York, May 19—The iron and steel trades continue active and improvement can be noted in more than one quarter. Buyers seem to have been convinced that they are warranted in anticipating improvement and are, accordingly, more willing to contract for future deliveries.

In pig iron the buying of foundry material is steadily increasing in Eastern territory, and an improvement is also noted in the West. Basic iron is not quite as active, chiefly for the reason that the larger makers of open-hearth steel who buy their iron have provided for their requirements over the third quarter of the year.

In finished material structural steel continues the more active department, but there have been good transactions in bars, plates and sheets. Wire products have been advanced by the principal producer $2 a ton above the lowest figures made. This action, it is said, is chiefly for the purpose of stopping speculative buying and it has been concurred in by several of the larger independent mills. Rail orders continue rather slow, but a number of contracts for cars have been placed and orders sent to the locomotive works are increasing their activity. Bridge orders from the railroads are coming in quite freely.

That the iron manufacturers are satisfied, is manifested by the fact that a number of companies which reduced wages last April have announced that the former standard will be established again on July 1. These companies include nearly all the more important independent producers.

The Steel Corporation has not so far made any general reduction in wages.

Lake Iron Ore—Iron-ore stocks on Lake Erie docks May 1, as compared with those on Dec. 1 are reported by the Cleveland *Iron Trade Review* as follows, in long tons:

	1907-8.	1908-9.	Changes.
Stocks, Dec. 1.....	7,385,728	8,441,533	I. 1,055,805
Stocks, May 1.....	5,480,300	5,370,268	D. 110,032
Ship'd to furnaces	1,905,428	3,071,265	I. 1,165,837

Adding these winter shipments to 17,453,258 tons, the amount shipped to furnaces during the navigation season of 1908, gives 20,524,523 tons as the entire shipment of ore from Lake Erie ports during the year ended May 1, 1909, as compared with 31,692,446 tons in the preceding year; a decrease of 11,167,923 tons.

Shipments of iron ore from the upper Lake ports in April were 55,794 tons, which compares with 630,975 tons in April of last year.

Lake Iron Ore Prices—It has been practically decided to quote prices on Lake Superior ore the same as last season—Old Range bessemers, $4.50; Mesabi bessemers, $4.25; Old Range non-bessemers, $3.70; Mesabi non-bessemers, $3.50, all f.o.b. Lake Erie port. The guarantee is unchanged also, being 55 per cent. iron, base on bessemers, and 51.5 per cent. iron on non-bessemer ores.

Baltimore

May 18—Exports for the week included 3,363,800 lb. steel billets and 87,460 lb. zinc dross to Liverpool; 799,123 lb. tin scrap to Rotterdam. Imports included 518 tons ferromanganese from Liverpool; 5350 tons iron ore from Cuba.

Birmingham

May 17—Southern pig-iron manufacturers continue to sell iron, though not in big lots. The aggregate is satisfactory, equal to, if not more than, the make. The production is showing some improvement; two furnaces were started this month by the Tennessee Coal, Iron and Railroad Company. Williamson furnace, in Birmingham, which has a daily capacity of about 90 tons, will be closed down for repairs. Iron prices in Southern territory remain about the same they have been, No. 2 foundry selling at $11.50 per ton minimum, with several of the companies holding for $12 for delivery during the latter part of the year. The home consumption continues steady, with prospects of a better demand. Several of the smaller industries in the Birmingham district are beginning to take on renewed life. The Stockham Pipe and Fitting Company has business in hand or in sight to warrant an operation of its plant double turn. The cast-iron pipe concerns in this territory are still receiving business. The Central Foundry Company is in full operation again on soil pipe after a disastrous fire several weeks ago. Machine shops and foundries throughout this sections are getting in some orders of consequence. Rumors prevail, without positive verification, that the Tennessee will shortly resume operations at the steel plant at Ensley.

Chicago

May 17—Conditions in the iron market are little changed. The average buyer is taking supplies in small lots; the larger interests are in general supplied up to the fourth quarter and not anxious to contract farther ahead. It seems to be taken for granted that pig iron will not go lower in price.

Southern iron brings $11.50@12, Birmingham ($15.85@16.35, Chicago), for No. 2. Some sales probably continue as low as $11, Birmingham, with some as high as $12.25. Iron for delivery in the fourth quarter brings $12 as a rule, the lower quotations being for delivery sooner. Northern holds at $16.50@17 to the consumer, the price of $16 at the furnace being made in some cases. Southern iron furnishes most of the speculative trading, Northern being quiet and comparatively steady. Lots sold are, in general, small now, running up to 300 to 400 tons. The tone of the market is one of growing confidence, as far as opinions of furnace agents are expressed.

In finished products the market sees good buying, sales of railroad materials and structural steel being large and increasing.

Coke is in better demand, but still at $4.70 for the best Connellsville.

Cleveland

May 18—Last season's ore prices having been reaffirmed, a number of sales have been made, the total being about 2,500,000 tons, probably. The prices are: Old Range bessemer, $4.50; Mesabi bessemer, $4.25; Old Range non-bessemer, $3.70; Mesabi non-bessemer, $3.50; all f.o.b. Lake Erie ports.

Pig Iron—No large sales, but a number of small ones, making a considerable total. Prices are firmer, and no sales are made below $15.25 for No. 2 foundry.

Finished Material—Sales of structural steel and bars continue good, with some trade in plates also.

Philadelphia

May 19—Fair sales of pig iron are reported, making up a large total. Foundry, basic and malleable have all sold, but forge iron drags behind still. Cast-iron pipe makers are in the market for some large lots of low-grade pig. Southern iron is not being pressed, though some Virginia furnaces are making offers. For foundry the basis is about $16.25, delivered, for No. 2X, with 25 or 50c. more asked for fourth quarter.

Steel Billets—Current business is for small orders, prompt delivery, sellers being unwilling to take long contracts on present prices.

Bars—Sales have been moderate but prices are firmer, though refined iron is still irregular. Store trade is improving.

Plates—Demand is still irregular, but there are some large inquiries floating around.

Sheets—More business is showing up, and mills are not inclined to shade prices.

Structural Material—Several large contracts and a number of small ones are under negotiation and likely to go through. Makers are inclined to be stiffer as to price.

Scrap—The market is stronger and dealers are quite chipper. Some of them are inclined to hold back, believing they will get better prices than are now offered.

Pittsburg

May 18—The advance of $1 per ton last week in bars and shapes seems to have been well taken. It has not checked orders, which continue good, so far as consumers are concerned. Speculative buying is not so active, though this is a matter not always easy to determine. However, jobbers are more cautious, apparently, about loading up.

The American Steel and Wire Company has advanced prices of wire and wire products $2 per ton, and this has been done also by the leading independents. The advance does not seem to have checked orders so far, though some jobbers are holding off.

Pig Iron—Demand seems to be improving a little, but the market is still below the expectations. Prices, however, are a shade firmer. Sellers are holding out for $14.75 for bessemer; $14.25 for basic and No. 2 foundry and $13.50 for gray forge, all at Valley furnaces. On large orders 25c. less might be done for early shipments.

Steel—A little more new business is reported. Deliveries continue good on old contracts. In the local market billets are firm at $23 and sheet-bars at $25.50, as formerly.

Sheets—Demand is better. Prices remain on the basis of 2.25c. for black and 3.25c. for galvanized, 28 gage, ordinary carloads. There is less talk of shading than there has been.

Ferromanganese—The market is quoted at $41, Baltimore, or $42.95, Pittsburg, for ordinary lots. For future deliveries $1 more is asked.

Foreign Iron Trade

German Iron Production—The German Iron and Steel Union reports production

of pig iron in Germany in March at 1,073,116 tons, or 123,449 tons more than in February. The daily average increased from 33,917 tons in February to 34,617 in March. For the three months ended March 31 the total was, in metric tons:

	1908.	1909.	Changes	
Foundry iron	583,421	560,882	D.	22,539
Forge iron.....	180,557	170,396	D.	10,161
Steel pig.....	271,260	277,416	I.	6,166
Bessemer pig.....	112,180	110,405	D.	1,775
Thomas(basic)pig	1,955,105	1,925,405	D.	29,700
Total.....	3,102,513	3,044,504	D.	58,009

Total decrease this year, 1.9 per cent. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

Metal Markets

New York, May 19—The metal markets show signs of increasing demand for manufacture and consumption, and some higher prices are recorded in consequence.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
April 1909..	$ 3,349,107	$ 6,337,994	Exp. $ 2,988,887
" 1908..	2,561,197	14,476,341	Exp. 11,915,144
Year 1909..	44,316,626	15,507,382	Exp. 28,809,244
" 1908..	18,335,344	19,857,221	Imp. 1,521,877
Silver:			
Apri 1909..	4,952,251	4,073,504	Exp. 878,747
" 1908..	4,462,564	3,467,926	" 994,638
Year 1909..	19,426,181	14,526,722	" 4,899,459
" 1908..	17,048,851	14,298,582	" 2,750,269

Exports from the port of New York, week ended May 15: Gold, $1,798,000, to Argentina and Paris; silver, $884,866, to London and Paris. Imports: Gold, $149,662, from Australia and South America; silver, $53,705, from the West Indies and Mexico.

Gold and silver movement in Great Britain, three months ended March 31:

	Imports.	Exports.	Excess.	
Gold.....	£16,131,463	£10,184,832	Imp.	£5,946,631
Gold, 1908...	11,167,244	8,024,886	Imp.	3,142,358
Silver.....	3,339,828	3,155,161	Imp.	184,667
Silver, 1908.	2,222,857	3,616,822	Exp.	1,393,965

Of the silver imported this year a total of £2,805,898 is credited to the United States.

Gold—There has been a demand for gold and the price on the open market in London has been 77s. 9⅜d. per oz. for bars. Most of the gold offered was taken for Austria. In New York exports reached $7,000,000, about $6,000,000 going to France, the rest to Brazil and Argentina.

Platinum—Business is dull and prices a little lower. Dealers ask $23@23.50 for refined platinum, and $25.50@26 for hard metal. Scrap is quoted at $19@20.50. The market is depressed by the existence of some stocks in the hands of small holders, who are anxious to turn their metal into cash.

Silver—Silver has settled to a more steady level. China has not been so active a buyer lately, and prices have been sustained by buying from India less moderate than the China operations had been previously.

SILVER AND STERLING EXCHANGE

May.	13	14	15	17	18	19
New York....	52¾	52⅞	52⅝	53	52⅝	52⅝
London.....	24¼	24 5/16	24⅛	24¾	24 5/16	24 3/16
Sterling Ex..	4.8775	4.8780	4 8780	4.8780	4.8780	4.8785

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, reported by Messrs. Pixley & Abell, year to May 6:

	1908.	1909.	Changes.	
India.... ...	£ 2,865,558	£1,519,300	D.	£1,346,258
China.....	511,400	1,038,200	I.	526,800
Straits.....	90,200	82,800	D.	7,400
Total.....	£ 3,467,158	£2,640,300	D. £	826,858

Copper, Tin, Lead and Zinc

May.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
13	13¼ @13⅜	12⅞ @13	59	29¼	4.30 @4 32½	4 22½ @4.25	4.90 @4.92½
14	13⅛ @13⅜	12⅞ @13	59⅛	29¼	4.30 @4.32½	4 22½ @4.25	4.92½ @4.95
15	13⅛ @13⅜	12⅞ @13	....	29¼	4.30 @4.32½	4.22½ @4.25	4.92½ @4.95
17	13⅛ @13⅜	12⅞ @13	59 1/16	29	4.30 @4.32½	4.22½ @4.25	4.95 @4.97½
18	13⅛ @13⅜	12⅞ @13	59	28⅞	4.30 @4.32½	4.22½ @4.25	4.97½ @5.00
19	13¼ @13⅜	12⅞ @13	59 1/16	28⅞	4.30 @4.32½	4.22½ @4.25	4.97½ @5.02½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—While the activity in this market has subsided somewhat, transactions continued during the week May 13-19 on a fair scale, and the tone remains very firm. Producers have greatly relieved themselves by the large sales effected within the last fortnight, and there is now a general appreciation that the deliveries have caught up with the production and may even surpass it. Consequently there is a great deal of confidence in the future of the market. This is manifested by the general disinclination to contract for delivery beyond July, and prices are stiffer for all future shipments than for prompt and near-by. The ideas of sellers in this respect are measured to a large extent by interest charges. None of the agencies is now aggressive in forcing sales, but for early delivery all offer electrolytic copper at 13⅛c., cash, delivered 30 days, or a little less than 13c., cash, New York. Some transactions were made during the week at less than 12⅞c. and some at a little more than 13c., but these were determined by special conditions. The case is similar with respect to certain transactions in Lake copper that were made at 13½c. However, the latter is understood to be the price that is now asked by the Calumet & Hecla. The closing quotations are unchanged at 13⅛@13⅜c. for Lake copper; 12⅞@13c. for electrolytic in ingots, cakes and wirebars; 12¾@12⅞ for casting copper. The average for casting copper was 12¾@12⅞ cents.

Copper sheets are 16½c. base for large lots. Full extras are charged, and higher prices—up to 18c.—for smaller quantities. Copper wire is 14½c. base, carload lots at mill. Business has been steady.

The standard market in London has held its own throughout the week, and the fluctuations would indicate that there has been an evening-up process among the various factions. The close is steady at £59 3s. 9d. for spot and £60 for three months.

Refined and manufactured sorts we quote: English tough, £63 10s.; best selected, £62 10s.@£63 10s.; strong sheets, £74 10s.@£76 10s.

It is reported that the selling of the product of the Utah Copper Company will soon pass from the United Metals Selling Company to the American Smelting and Refining Company.

Tin—The increased shipments from the East, which were reported for the first half of this month, created a depressing influence in the market. Transactions, however, were of small volume and changes in the quotations of small moment. The close is cabled at £131 2s. 6d. for spot, £132 5s. for three months.

The domestic market followed closely, as far as prices are concerned, that of London. Business is reported as satisfactory and consumption seems to keep up on a fairly good level. The market closes at about 28⅞ cents.

Lead—There is a good business doing, and quotations have again advanced somewhat, particularly in the West, the close in St. Louis being 4.22½@4.25c., while the metal is quoted at 4.30@4.32½c. New York.

The tone of the London market has also improved, and sales have been of a larger volume. The close is stronger at £13 6s. 3d. for Spanish and £13 8s. 9d. for English.

Spelter—Under the influence of a very heavy inquiry from the galvanizers, the market advanced from day to day and closes strong at 5.12½@5.17½c. New York, 4.97½@5.02½c. St. Louis.

Quotations for spelter in New York, May 13, were 5.05@5.07½c.; May 14 and 15, 5.07½@5.10c.; May 17, 5.10@5.12½c.; May 18, 5.12½@5.15c.; May 19, 5.12½@5.17½ cents.

The market in London is also higher, the closing quotations being cabled at £22 for good ordinaries, £22 5s. for specials.

Base price of sheet zinc is now 6¾c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—Business during the week has been quiet, with few sales. Prices are nominally unchanged at 8¼@8½c. for Cookson's; 7¾@8c. for U. S., and 7¼@7½c. for outside brands.

Aluminum—Quotations are 22@24c. per lb. base for No. 1 ingots in large lots; 31@32c. base for wire, and 33@34c. base for shorts. Business is steady, but not especially active.

Quicksilver—Business has been rather dull, but prices are steady. New York, $44.50 per flask of 75 lb. San Francisco, $44 for domestic and $42 for export orders. London quotation is £8 7s. 6d. per flask, with 3s. 9d. less quoted by jobbers.

Nickel—Large lots, contract business, 40@50c. per lb. Retail, spot, from 50c. for 2000-lb. lots up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotation 75c. per lb., in 100-lb. lots, at Cleveland, Ohio.

Magnesium—Quotations for this metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, $1.40 per pound.

Spanish Metal Exports

Exports of metals and minerals from Spain in January, reported by *Revista Minera*, in metric tons:

Metals.	1908.	1909.	Changes.
Pig and manuf. iron	892	3,226	I. 2,334
Copper	786	1,629	I. 843
Copper precipitate	1,822	1,463	D. 359
Lead	12,056	9,698	D. 2,358
Zinc	2	37	I. 35
Quicksilver	9	1	D. 8
Minerals.			
Iron ore	525,572	479,678	D. 45,894
Manganese ore	4,288	.....	D. 4,288
Copper ore	101,499	63,543	D. 37,956
Lead ore	215	86	D. 129
Zinc ore	8,375	7,250	D. 1,125
Pyrites	116,896	97,712	D. 19,184
Salt	39,685	45,905	I. 6,220

Zinc and Lead Ore Markets

Joplin, Mo., May 15—The highest price reported paid for zinc was $42 on a base price of $39 per ton of 60-per cent. zinc, the highest grade ores bringing only a $30 base against a $39.50 to $40 base price for 59 to 60 per cent. grades. The week was one of scattering prices; 300 tons of 60-per cent. ore sold on a $37 base, 200 tons of 59 to 60 per cent. on a $40 base, 150 tons sold on a $39.50 base. The bulk of ore sold, however, on a $38 to $39 base. Silicate ores sold from $17@20 per ton of 40-per cent. zinc. The average price, all grades, was $35.90. Lead prices were again stronger, as high as $57.50 being paid for this week's delivery, with $60 bid for delivery early next week. The average price on this week's settlements, all grades, was $55.84 per ton.

This spring has been one of exceptional outputting conditions, and the mines are generally being operated to the full capacity, except those mines that cannot be operated on the present level of prices.

SHIPMENTS, WEEK ENDED MAY 15.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,466,120	671,880	$ 82,935
Joplin	2,487,240	402,560	60,393
Galena	853,240	120,600	18,854
Prosperity	355,780	334,300	15,941
Miami	788,350	65,090	13,252
Duenweg	521,290	113,410	11,652
Carthage	379,010	.....	9,390
Alba-Neck	362,990	.....	6,895
Granby	483,430	23,410	6,044
Aurora	307,280	.....	5,305
Spurgeon	201,410	75,130	4,926
Badger	249,730	.....	4,868
Quapaw-Baxter	149,940	47,370	4,063
Zincite	155,270	.....	3,027
Sarcoxie	123,540	.....	2,284
Carl Junction	74,880	.....	1,497
Wentworth	83,880	.....	879
Totals	11,043,380	1,853,760	$250,205
20 weeks	225,032,590	36,648,270	$5,025,482

Zinc value, the week, $198,330; 20 weeks, $4,061,542
Lead value, the week, 51,875; 20 weeks, 963,940

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	.....	33.39	.....	56.05	.....
June	33.06	.....	32.07	.....	60.48	.....
July	34.55	.....	31.67	.....	59.90	.....
August	36.53	.....	33.42	.....	60.34	.....
September	37.63	.....	34.44	.....	54.59	.....
October	35.95	.....	33.28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., May 15—The highest price paid this week for zinc ore was $40.50 per ton; the base price of 60 per cent. zinc declined from $40 to $39 per ton. For 80 per cent. lead ore $54 per ton was paid; one car, 82 per cent., brought $56 per ton. The week's shipment is the heaviest of the year; a large accumulated stock is beginning to move. Conditions are now ideal for outputting, after a backward spring, and a general resumption of activity is in evidence.

SHIPMENTS, WEEK ENDED MAY 15.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	961,320	.....	158,900
Benton	386,700	.....	.....
Highland	380,500	.....	.....
Strawbridge	352,000	68,600	.....
Hazel Green	345,500	65,000	.....
Cuba City	251,800	.....	.....
Galena	240,000	.....	.....
Livingston	160,000	.....	.....
Linden	121,430	.....	.....
Harker	58,010	.....	.....
Total	3,257,260	133,600	158,900
Year to May 15	39,583,754	1,397,660	3,123,700

In addition to the above there was shipped to the American Zinc Ore Separating Company 600,490 lb., and to the Joplin Separator Works 258,000 lb. zinc concentrates.

Petroleum

May 19—Exports of mineral oils from the United States, four months ended April 30, in gallons:

	1908.	1909.
Crude petroleum	29,987,851	44,959,602
Naphthas	10,176,153	23,407,046
Illuminating oils	344,121,231	335,556,561
Lubricating oils	53,515,097	48,862,589
Residuum	14,783,172	32,601,010
Total	452,583,504	485,386,808

Paraffin is included in lubricating oils. The total increase this year was 32,803,304 gal., or 7.2 per cent.

Chemicals

New York, May 19—The market shows no considerable change. Deliveries on contracts are somewhat more active but current business is only moderate.

Copper Sulphate—Sales continue steady but not especially active. Current quotations are unchanged at $4.22½ per 100 lb. for carload lots, and $4.47½ per 100 lb. for smaller parcels.

Arsenic—Current quotations are unchanged at 2⅞@3c. per lb. for white arsenic. The sales for the week approximate 50 tons.

Nitrate of Soda—The market continues quite active, a good business being done at unchanged quotations, 2.15c. for spot and 2.12½c. for futures.

Mining Stocks

New York, May 19—The general mining-stock market has been much less active than during the preceding week. There was more or less recession of prices from the high levels then attained. This was not altogether due to profit taking, but seems to indicate that the bull movement had advanced farther than was really warranted by conditions. Trading diminished in volume and the course of prices was rather irregular, a few stocks gaining while others lost. The close is quite uncertain, and it cannot be said that there is any decided tendency apparent.

Henry H. Rogers died this morning. The effect of his death on the market can hardly be gaged yet; but it must be remembered that he had not been specially active for two years past.

On the Curb trading was rather dull with some losses in quotations, especially in the copper stocks. These, however, were variable and for no apparent reason. Cobalt mining stocks continue in favor, and generally held their own pretty well. The Nevada gold stocks, however, were rather neglected.

Boston, May 18—The North Butte mining episode resulted in killing off an increasing interest in the market for min-

ing shares and net results for the past week are general declines with some few exceptions. It is believed, however, that the declaration of the usual quarterly dividend of $1 per share by this company will have a steadying influence and that there will be less cause for attacking the stock. In addition Quincy mining directors, as well as Calumet & Arizona and Old Dominion, have declared regular dividends so that these ought to serve as bullish factors.

Brokerage houses are in a good condition and money continues easy. Brokers report that their liabilities are smaller than they were a few weeks ago so that stocks are in strong hands. The exceptions, as far as advances are concerned, are Nevada Consolidated, which records a net gain of $1.87½ to $23.50, which is its record price. Osceola has made a gain of $4 to $13, and Parrott is fractionally higher than a week ago. U. S. Smelting has risen $1.62½, net, to $47.37½ and the preferred $1.50 to $48.25 per share.

East Butte ran off $1.50 to $12.87½; rights on the same varied from 55 to 70c., each share carrying four of them. North Butte did not get below $60 during the week, even though there was one or two incipient bear raids.

The Curb features have been in the higher grade of stocks. Helvetia made a high at $6.12½, assessment paid. Ohio Copper had good advance. Southwestern Development has been the most active feature, largely through newspaper advertising.

STOCK QUOTATIONS

NEW YORK	May 19
Name of Comp.	Clg.
Alaska Mine	.45
Amalgamated	83⅛
Anaconda	50⅜
Balaklala	‡2 1/16
British Col. Cop.	6⅞
Buffalo Mines	‡3⅛
Butte Coalition	26⅛
Colonial Silver	7/8
Cum. Ely Mining	8 7/16
Davis-Daly	6¾
Dominion Cop.	⅛
Douglas Copper	2¾
El Rayo	2⅛
Florence	2⅞
Foster Cobalt	.32
Furnace Creek	.12
Giroux	7⅞
Gold Hill	⅛
Goldfield Con	7 1/16
Granby	103
Greene Gold	½
Greene G. & S.	9
Guanajuato	1⅝
Guggen. Exp.	195
Hanapah	.15
Kerr Lake	8¼
McKinley Dar.	.91
Miami Copper	15⅜
Micmac	⅜
Mines Co. of Am.	1/16
Mitchell Mining	⅜
Mont. Sho. C.	1 1/32
Nev. Utah M. & S.	2¾
Newhouse M. & S.	2⅞
Nipissing Mines	10⅜
Old Hundred	⅜
Silver Queen	.42
Stewart	¾
Tennessee Cop'r.	42⅛
Tri-Bullion	⅞
Union Copper	1⅛
Utah Apex	6⅛
Utah Copper	51⅛
Yukon Gold	4¾

BOSTON	May 19
Name of Comp.	Clg.
Adventure	9
Allouez	‡40
Am. Zinc	25
Arcadian	5
Arizona Com.	43⅞
Atlantic	9⅜
Boston Con.	15⅛
Calumet & Ariz.	103
Calumet & Hecla	645
Centennial	‡30½
Copper Range	80⅛
Daly-West	9⅛
East Butte	14⅛
Franklin	15¼
Greene—Can.	10¾
Hancock	‡10¼
Isle Royal	28
Keweenaw	3
La Salle	14½
Mass.	14⅛
Michigan	12
Mohawk	.65
Nevada	23½
North Butte	62
Ojibway	11¼
Old Colony	‡.60
Old Dominion	‡54½
Osceola	‡133
Parrot	34½
Quincy	‡90
Rhode Island	‡4¾
Shannon	15¾
Superior	‡41¾
Superior & Bost*	14
Superior & Pitts.	14¼
Tamarack	‡73
Trinity	13⅜
U. S. Smg. & Ref.	47⅛
U.S. Sm. & Re., pd.	48⅛
Utah Con.	41½
Victoria	5
Winona	6½
Wolverine	‡148
Wyandotte	2¾

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	39
Am. Smelt. & Ref.	93½
Am.Sm. & Ref., pf.	109¾
Colo. Fuel & Iron.	41¼
Federal M. & S.,pf.	‡91½
National Lead	88
National Lead, pf.	106¼
Pittsburg Coal	11½
Republic I. & S.	27⅜
Republic I. & S.,pf.	87¾
Sloss-Sheffield	80¾
Standard Oil	677
U. S. Steel	58¼
U. S. Steel, pf.	119⅛
Va. Car. Chem.	50

BOSTON CURB	Low.
Ahmeek	150
Black Mt.	.90
Chemung	16
Globe Con	5⅛
Helvetia	5⅞
North Lake	‡7⅛
Ray Central	3⅜
Ray Con.	15⅜
San Antonio	13¾

ST. LOUIS	May 15		
N. of Com.	High.	Low.	
Adams	.40	.30	
Am. Nettie	.08	.05	
Center Cr'k	2.00	1.50	
Cent.C.& C.	80.00	79.00	
C.C. & C. pd.	80.00	79.00	
Cent. Oil	110.00	100.00	
Columbia	8.00	6.00	
Con. Coal	20.00	19.00	
Doe Run	115.00	115.00	
Gra. Bimet.	.30	.22	
St. Joe	14 00	12.50	

LONDON	May 12		
Name of Com.	Clg.		
Dolores	£1	5s	0d
Stratton's Ind.	0	3	1½
Camp Bird	1	2	9
Esperanza	3	0	0
Tomboy	1	2	6
El Oro	1	6	3
Oroville	0	11	9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. May 19.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.48
Best & Belcher	.35
Caledonia	.10
Chollar	.06
Comstock	.28
Con. Cal. & Va.	.65
Crown Point	.47
Exchequer	.25
Gould & Curry	.09
Hale & Norcross	.17
Mexican	.76
Ophir	1.30
Overman	.15
Potosi	.14
Savage	.19
Sierra Nevada	.27
Union	.33
Utah	.04
Yellow Jacket	.57
TONOPAH STOCKS	
Belmont	.78
Extension	.63
Golden Anchor	...
Jim Butler	.15
MacNamara	.23
Midway	.23
Montana	.75
North Star	02
Tono'h Mine of N.	7.12½
West End Con.	29
GOLDFI'D STOCKS	
Adams	.02
Atlanta	.15
Blue Bell	.04
Booth	.18
Columbia Mt.	.11
Comb. Frac.	.83
Con. Red Top	.03
Cracker Jack	.03
Dia'dfield B. B. C.	.05
Goldfield Belmont	.04
Goldfield Daisy	.28
Great Bend	.09
Jumbo Extension	.12
Kendall	.05
Lone Star	.05
May Queen	.04
Oro	.08
Red Hill	.08
Roanoke	...
Sandstorm	.12

Name of Comp.	Clg.
Silver Pick	18
St. Ives	.10
Triangle	.01
BULLFROG STOCKS	
Gibraltar	.04
Homestake King.	.01
Mont. Shoshone C.	1.87½
Tramp.Cons.	.06
MISCELLANEOUS	
Bonnie Clare	...
Lee Gold Grotto	...
Nevada Hills	1 25
Nevada Smelting.	.87½
Nevada Wonder	.60
Nevada-Utah	2.68¾
Penn-Wyoming	.05
Pittsburgh S. Pk.	.52
Rawhide Caol't'n.	...
Round Mt. Sphinx	.13

COLO. SPRINGS	May 14
Name of Comp.	Clg.
Acacia	.06½
Black Bell	...
C. C. Con.	.03
Dante	.06
Doctor	.09
Elkton	.63½
El Paso	.48½
Findlay	.15
Gold Dollar	.11½
Gold Sovereign	‡.03
Isabella	.20½
Jack Pot	.07½
Jennie Sample	.06¾
Jerry Johnson	‡.05¾
Mary McKinney	.38
Pharmacist	‡.03
Portland	.91
Un. Gold Mines	.06¼
Vindicator	.60
Work	.06¼

Assessments

Company.	Delinq.	Sale.	Amt.
Blue Wing, Ida	May 8	June 5	$0.005
Carney Copper, Ida	Mar. 25	May 1	0.003
Confidence, Nev.	May 18	June 8	0.20
Con. Imperial, Nev.	May 26	June 17	0.01
Dalton M. & M., Utah	May 26	June 9	0.00½
Echo, Ida	May 1	June 1	0.002
Elk M. & M., Ida.	Apr. 20	May 20	0.001
Exchequer, Nev	May 5	May 26	0.05
Hecla M. & M., Utah	May 15	June 14	0.05
Imlay, Nev.	Apr. 6	Apr. 28	0.03
Julia Con., Nev.	May 24	June 17	0.03
Laclede, Ida.	Apr. 7	May 1	0 003
Mexican, Nev	Apr. 8	Apr. 29	0.10
Nev. Superior	Apr. 10	May 1	0.07½
Palmyra G. & C., Utah	June 11	June 30	0.001
Reindeer C. & G., Ida.	Apr. 28	May 28	0.005
Savage, Nev.	Apr. 8	May 5	0.10
Sierra Nevada, Nev.	May 4	May 25	0.10
Uintah Treas. Hill, Utah	May 20	June 9	0.01
Utah, Nev.	May 6	May 27	0.03
Yerington Gold, Nev.	Apr. 8	May 12	0.005

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	.....	24.377	.....
June	53.663	.....	24.760	.....
July	53.115	.....	24.514	.....
August	51.683	.....	23.858	.....
September	51.720	.....	23.877	.....
October	51.431	.....	23.725	.....
November	49.647	.....	22.933	.....
December	48.766	.....	22.493	.....
Year	52.864	.....	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61 198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56½	12.928	12.93¾	58.331	57.363
May	12.598	.....	12.788	.....	57.387	.....
June	12.675	.....	12.877	.....	57.842	.....
July	12.702	.....	12.933	.....	57.989	.....
August	13.462	.....	13.639	.....	60.500	.....
September	13.388	.....	13.600	.....	60.338	.....
October	13.354	.....	13.646	.....	60.139	.....
November	14.130	.....	14.386	.....	63.417	.....
December	14.111	.....	14.411	.....	62.943	.....
Year	13.208	.....	13.424	.....	59.902	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28 060	July	29.207	.....
February	28.978	28.290	August	29.942	.....
March	30.577	28.727	September	28.815	.....
April	31.702	29.445	October	29.444	.....
May	30.015	.....	November	30.348	.....
June	28.024	.....	December	29.154	.....
			Av. Year	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	.....	.....	12.938	.....
June	4.466	.....	.....	12.600	.....
July	4.744	.....	.....	13.000	.....
August	4.580	.....	.....	13.375	.....
September	4.515	.....	.....	13.125	.....
October	4.351	.....	.....	13.375	.....
November	4.330	.....	.....	13.538	.....
December	4.213	.....	.....	13.156	.....
Year	4.200	.....	.....	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	.....	4.458	.....	19.906	.....
June	4.543	.....	4.393	.....	19.000	.....
July	4.485	.....	4.338	.....	19.031	.....
August	4.702	.....	4.556	.....	19.350	.....
September	4.769	.....	4.619	.....	19.563	.....
October	4.801	.....	4.651	.....	19.750	.....
November	5.059	.....	4.909	.....	20.875	.....
December	5.137	.....	4.987	.....	20.625	.....
Year	4.726	.....	4.578	.....	20.163	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

Mining and Metallurgical Companies—U. S.

Name of Company and Location.		Shares. Issued.	Par Val.	Dividends. Total to Date.	Latest. Date.	Amt.
Alaska, Mexican, g..	Alas.....	180,000	$ 5	$ 2,184,381	April '09	$0.40
Alaska Treadwell, g.	Alas.....	200,000	25	10,485,000	April '09	0.50
Alaska United, g....	Alas.....	180,200	5	513,520	April '09	0.25
Amalgamated, c....	Mont.....	1,538,879	100	70,018,993	May '09	0.50
Am. Sm.&Ref., com.	U. S.....	500,000	100	16,000,000	April 09	1.00
Am. Sm. & Ref., pf.	U. S.....	500,000	100	30,625,000	April '09	1.75
Am. Smelters, pf. A.	U. S.....	170,000	100	3,965,000	June '09	1.50
Am. Smelters, pf B.	U. S.....	300,000	100	6,000,000	June '09	1.25
Am. Zinc, Lead&Sm.	Kan.....	80,000	25	280,000	Nov. '07	0.50
Anaconda, c.....	Mont.....	1,200,000	25	43,650,000	Jan. '09	0.50
Arizona, c.....	Ariz.....	3,682,520	....	6,182,520	April '06	0.50
Atlantic, c.....	Mich.....	100,000	25	990,000	Feb. '05	0.02
Bald Butte, g. s....	Mont.....	250,000	1	1,354,648	Oct. '07	0.04
Beck Tunnel, g. s. l.	Utah.....	1,000,000	0.10	675,000	Oct. '07	0.02
Bent'n M.&D.,pf.,l.z.	Wis.....	196,607	1	10,949	Nov. '08	0.01½
Boston & Montana..	Mont.....	150,000	25	53,400,000	April '09	3.00
Bull,Beck. & Cham.g	Utah.....	100,000	10	2,728,400	July '08	0.10
Bunker Hill & Sull..	Ida.....	300,000	10	10,971,000	May '09	0.15
Butte Coalition, c. s.	Mont.....	1,000,000	15	2,450,000	Dec. '07	0.15
Calumet & Arizonac.	Ariz.....	200,000	10	10,500,000	Mar. '09	1.00
Calumet & Hecla, c..	Mich.....	100,000	25	108,350,000	Mar. '09	5.00
Camp Bird, g., s....	Colo.....	820,000	5	5,707,200	April '09	0.24
Carisa, c. g.....	Utah.....	500,000	1	55,000	Nov. '06	0.01
Colorado, l. g. s....	Utah.....	1,000,000	0.20	1,390,000	April '09	0.08
Columbus Con., c...	Utah.....	283,.40	5	226,832	Oct. '07	0.20
Combi'tion Co. G'f'd.	Nev.....	320,000	1	688,000	Sept. '06	0.15
Con. Mercur, g.....	Utah.....	1,000,000	1	3,385,313	Dec. '06	0.02½
Continental, z. l....	Mo.....	22,000	25	231,000	Oct. '08	0.25
Copper Range Con..	Mich.....	384,185	100	8,067,885	April '09	1.00
Creede United, g....	Colo.....	1,625,000	1	214,053	July '06	0.00½
Daly Judge, g. s. l..	Utah.....	300,000	1	225,000	April '07	0.37½
Daly West, g. s. l...	Utah.....	180,000	20	5,731,000	April '09	0.30
De Lamar, g. s.....	Ida.....	80,000	5	835,200	Sept. '06	0.24
Doe Run, l.....	Mo.....	59,062	100	1,859,893	Mar. '09	1.50
Elkton Con., g.....	Colo.....	2,500,000	1	2,316,959	April '09	0.01½
El Paso, g.....	Colo.....	2,450,000	1	1,315,545	Sept. '08	0.01
Fed. Sm., com.....	Idaho.....	60,000	100	2,708,750	Jan. '09	1.50
Federal Sm., pf.....	Idaho.....	120,000	100	4,331,250	Mar. '09	1.75
Findley, g.....	Colo.....	250,000	1	337,500	Sept. '06	0.01
Florence, g.....	Nev.....	1,050,000	1	420,000	Nov. '08	0.10
Frances-Mohawk, g.	Nev.....	912,000	1	546,000	Jan. '08	0.05
Gemini-Keystone...	Utah.....	5,000	100	2,000,000	Aug. '07	10.00
Gold King Con.....	Colo.....	3,750,370	1	1,407,504	May '05	0.01
Goldfield Con., g....	Nev.....	3,532,371	10	1,770,428	April '09	0.30
Grand Central, g...	Utah.....	250,000	1	1,321,250	Dec. '07	0.04
Gwin Mine, Dev., g..	Cal.....	100,000	10	496,000	April '06	0.05
Hecla, s. l.....	Idaho.....	1,000,000	0.25	1,690,000	Dec. '08	0.01½
Homestake, g.....	S. D.....	218,400	100	24,372,440	May '09	0.50
Horn Silver, g.s.c.z.l.	Utah.....	400,000	25	5,642,000	Sept. '07	0.05
Imperial, c.....	Ariz.....	500,000	10	300,000	June '07	0.20
Inter'l Nickel, pf...	N. Y.....	89,126	100	1,871,646	May '09	1.50
Iron Blossom, s. l...	Utah.....	1,000,000	0.10	80,000	April '09	0.08
Iron Silver.....	Colo.....	500,000	20	4,100,000	Oct. '07	0.10
Jamison, g.....	Cal.....	390,000	10	347,100	April '09	0.02
Jerry Johnson.....	Cal.....	1,500,000	1	86,700	Jan. '08	0.01
Kendall, g.....	Mont.....	500,000	5	1,275,000	Oct. '08	0.02
Liberty Bell, g. s...	Colo.....	130,551	5	130,440	Jan. '07	0.15
Lightner, g.....	Cal.....	102,255	1	253,081	Oct. '06	0.05
Lower Mammoth, g.	Utah.....	190,000	1	57,000	Sept. '07	0.07½
Mammoth, g. s. l...	Utah.....	400,000	2.50	2,220,000	Mar. '08	0.05
Mary McKinney, g..	Colo.....	1,309,252	1	841,093	Dec. '08	0.02
May Day, g. s. l....	Utah.....	800,000	1	108,000	Sept. '08	0.01½
Mohawk, W.....	Mich.....	100,000	25	1,850,000	Feb. '09	2.00
Mont. Ore Punch...	Mont.....	80,833	25	9,437,274	Jan '07	15.00
Nevada Hills, s.g....	Nev.....	746,000	5	373,000	Dec. '07	0.10
New Century, z. l...	Mo.....	300,000	1	213,000	Dec. '06	1.01
Newhouse M. & S. c.	Utah.....	600,000	10	300,000	Sept. '07	0.50
New Idria, q.....	Cal.....	100,000	5	1,080,000	Jan. '09	0.30
New Jersey Zinc....	U. S.....	100,000	100	12,000,000	May '08	4.00
North Butte.....	Mont.....	400,000	15	7,200,000	June '09	1.00
North Star, g.....	Cal.....	250,000	10	1,911,988	Mar. '09	0.30
Old Dominion, c....	Ariz.....	293,245	25	849,332	Mar. '09	0.50
Old Dominion,M&Sc	Ariz.....	162,000	25	526,500	Mar. '09	1.00
Ophir, g. s.....	Nev.....	201,600	3	1,816,360	May '08	0.10
Osceola, c.....	Mich.....	96,150	25	7,420,250	Jan. '09	2.00
Parrot, c. s.....	Mont.....	229,850	10	6,807,649	Sept. '07	0.25
Pennsylvania, g....	Cal.....	51,500	100	284,925	July '05	0.10
Phelps, Dodge & Co.	U. S.....	44,934,600	1	1,123,365	April '09	0.02½
Portland, g.....	Colo.....	3,000,000	1	8,227,080	Jan. '09	0.40
Quartette, g. s.....	Nev.....	100,000	10	375,000	July '07	0.20
Quincy, c.....	Mich.....	110,000	25	18,560,000	Mar. '09	1.00
Sacramento, g. q....	Utah.....	1,000,000	1	225,000	Nov. '06	0.00½
St. Joseph, l.....	Mo.....	1,000,000	10	6,308,357	Mar. '09	0.15
Shannon, c.....	Ariz.....	300,000	10	450,000	July '07	0.50
Silver Hill, g. s....	Nev.....	108,000	1	81,000	June '07	0.05
Silver King, g. s. l.†	Utah.....	150,000	20	11,187,500	July '07	0.33½
Silver King Co't'n.†	Utah.....	1,224,425	5	1,105,402	April '09	0.15
Sioux Con.....	Utah.....	746,389	1	335,595	April '09	0.07
Snowstorm, s. l.....	Ida.....	1,500,000	1	690,000	Feb. '09	0.03
Standard Con., g. s..	Cal.....	178,394	10	5,194,130	Dec. '08	0.10
Stratton's Independ.	Colo.....	1,000,000	5	4,895,865	April '06	0.12½
Swansea, g. s. l.....	Utah.....	100,000	5	329,500	Mar. '07	0.05
Tamarack, c.....	Mich.....	60,000	25	9,420,000	July '07	4.00
Tennessee, c.....	Tenn.....	200,000	25	2,056,250	Sept. '08	1.25
Tomboy, g. s.....	Colo.....	300,000	5	2,016,000	Dec. '08	48
Tonopah of Nev....	Nev.....	1,000,000	1	4,600,000	April '09	0.35
Tonopah Belmont..	Nev.....	1,500,000	1	600,000	April '07	0.10
Tonopah Ext'nsion..	Nev.....	928,433	1	283,030	April '06	0.15
Tonopah Midway...	Nev.....	1,000,000	1	250,000	Jan. '07	0.05
Uncle Sam, g. s. l...	Utah.....	500,000	1	295,000	Dec. '08	0.02
United States, com..	Utah.....	350,933	50	2,148,099	April '09	0.50
United States, pfd.*.	Utah.....	485,845	50	5,306,495	April '09	0.87½
United Cop. com...	Mont.....	450,000	100	5,962,500	Aug. '07	1.75
United, c. pf.....	Mont.....	50,000	100	1,500,000	May '07	3.00
United, z. l., pf....	Mo.-Kan.	19,556	25	312,782	Jan. '08	0.50
United Verde, c....	Ariz.....	300,000	10	1,385,322	Mar. '09	0.75
U. S. Red. & Ref. Pf.	Colo.....	39,458	100	1,005,504	Oct. '07	1.50
Utah, g. (Fish Sp'gs)	Utah.....	100,000	10	323,000	Feb. '09	0.02
Utah Con., c.....	Utah.....	300,000	5	7,500,000	April '09	0.50
Utah Copper.....	Utah.....	725,950	10	1,088,925	Mar. '09	0.50
Victoria, Utah.....	Utah.....	250,000	1	177,000	Mar. '07	0.04
Vindicator Con., g..	Colo.....	1,500,000	1	1,980,000	Jan. '09	0.03
Wolverine, c.....	Mich.....	60,000	25	5,400,000	April '09	5.00
Work, g.....	Colo.....	1,500,000	1	172,500	July '08	0.01
Yankee Con.....	Utah.....	1,000,000	1	182,500	Jan. '07	0.03
Yellow Aster, g....	Cal.....	100,000	10	958,789	Aug. '07	0.20

*Previous to consolidation $1,436,250 were divided. †Amalgamaetd.

Coal, Iron and Other Industrials—United States

Name of Company and Location.		Shares. Issued.	Par Val.	Dividends. Total to Date.	Latest. Date.	Amt.
Allis-Chalmers, pf...	U. S.....	161,500	100	$3,108,875	Feb. '04	$1.75
Amer. Ag. Chem., pf.	U. S.....	181,530	100	1,747,620	April '09	3.00
American Cement...	Pa.....	200,000	10	1,288,000	Jan. '09	0.30
American Coal.....	Md.....	50,000	25	2,555,000	Mar. '09	1.25
Bethlehem Steel, pf.	Pa.....	150,000	100	900,000	Nov. '06	0.75
Cambria Steel.....	Pa.....	900,000	50	9,450,000	Feb. '09	0.75
Central C. & C., com.	Mo.....	51,250	100	2,613,750	April '09	1.50
Central C. & C., pf...	Mo.....	18,750	100	1,476,562	April '09	1.25
Col.&Hock. C.&I.,pf.	Ohio.....	69,244	100	383,818	April '08	1.50
Consolidated Coal..	Ill.....	50,000	100	350,000	July '04	1.00
Consolidation Coal..	Md.....	102,500	100	x10 431,650	Jan. '09	3.50
Crucible Steel, pf...	Pa.....	244,365	100	8,430,593	Mar. '09	1.00
Empire S. & I., pf...	N. J.....	25,000	100	933,033	Jan. '09	1.50
Fairmont Coal.....	W. Va...	120,000	100	1,980,000	Jan. '09	2.00
Gen. Chem., com....	U. S.....	74,103	100	2,297,193	June '09	1.00
General Chem., pf..	U. S.....	100,000	100	6,255,000	Jan. '09	1.50
International Salt...	Penn.....	182,280	100	911,400	Dec. '06	1.00
Jeff.&Cl'f C.&I., cm.	Pa.....	15,000	100	330,000	Aug. '05	5.00
Jeff.& Cl'f C. & I., pf.	Pa.....	15,000	100	900,000	Feb. '09	2.50
Kern River Oil.....	Cal.....	20,000	100	84,000	July '08	0.10
Lehigh Coal & Nav..	Pa.....	382,260	50	15,779,410	May '09	2.00
Maryland Coal, pf..	Md.....	18,850	100	‡2,013,997	Dec. '08	2.50
Monon R. Coal, pf...	Pa.....	100,000	100	2,324,000	July '08	3.50
Nat. Carbon, com...	U. S.....	55,000	100	715,000	April '08	1.00
Nat. Carbon, pf....	U. S.....	45,000	100	3,071,250	Nov. '08	1.75
National Lead, com..	N. Y.....	149,054	100	3,279,189	April '09	1.25
National Lead, pf...	N. Y.....	149,040	100	18,155,068	Mar. '09	1.75
Nat'l Steel&Wire,pf.	N. Ye.....	25,778	100	631,561	May '06	1.75
New Central Coal...	Md.....	50,000	20	390,000	Nov. '08	0.40
New River Coal, pf..	W. Va...	37,617	100	451,405	Nov. '08	1.50
Pacific Coast Borax..	Cal.....	19,000	100	2,086,500	Aug. '05	1.00
Peerless Oil.....	Cal.....	92,000	10	711,000	June '08	0.06
Penna. Salt.....	Pa.....	60,000	50	15,098,000	Oct. '08	3.00
Penna. Steel, pf.....	Pa.....	165,000	100	8,662,500	Nov. '08	3.50
Phila. Gas, com.....	Pa.....	664,800	50	*24,264,600	Feb. '09	0.75
Phila. Gas, pf.....	Pa.....	120,000	50	2,850,000	Sept. '08	1.25
Pittsburg Coal, pf...	Pa.....	297,010	100	11,434,962	April '09	1.75
PocadontasC.C., pf.†	W.sVa...	28,000	100	252,000	Jan. '09	3.00
Pocah'tasC.C., cm.†	W. Va...	45,000	100	†406,800	Oct. '08	3.00
Republic I.&S., pfd.	Ill.....	204,169	100	6,045,338	April '08	1.75
Sloss-Sheffield, com.	Ala.....	100,000	100	2,133,000	June '09	1.25
Sloss-Sheffield, pf...	Ala.....	67,000	100	4,221,000	Jan. '09	1.75
Standard Oil.....	U. S.....	970,000	100	652,802,905	June '09	9.00
Tenn. C. & I., com...	Tenn.....	225,536	100	3,583,060	Nov. '07	1.00
Tenn. C. & I., pf...	Tenn.....	2,480	100	390,040	Nov. '07	2.00
Texas & Facific Coal.	Texas....	23,940	100	1,747,620	April '09	1 50
Uni. Metals Selling..	U. S.....	50.000	100	5,875,000	Jan. '09	5.00
U.S. Steel Corp., cm.	U. S.....	5,083,025	100	83,848,056	Mar. '09	0.50
U. S. Steel Corp., pf.	U. S.....	3,602,811	100	231,585,110	Mar. '09	1.75
Va. Carolina Ch., pf.	U. S.....	180,000	100	14,700,869	April '09	2.00
Warwick I. & S.....	U. S.....	148,671	10	517,739	Nov. '08	0.30
Westmoreland Coal..	Pa.....	60,000	50	8,880,000	Oct. '08	2.50

*Since 1894. †Since 1907. ‡Since 1890. xStock div. $6,130,000 Mar. '09

Canada, Mexico, Central and South America

Name of Company and Location.		Shares. Issued.	Par Val.	Dividends. Total to Date.	Latest. Date.	Amt.
Amistad y Conc'rdia	Mex.....	9,600	50	$417,070	April '08	$1.36
Batopilas.....	Mex.....	446,268	20	†55,784	Dec. '07	0.12½
British Columbia, c.	B. C.....	503,000	5	201,200	Sept. '07	0.40
Buffalo, s.....	Ont.....	900,000	1	399,000	May '09	0.01
Butters' Salvador, g.	Salv.....	150,000	5	600,000	April '05	0.25
Cobalt Central, s...	Ont.....	4,761,500	1	92,230	Feb. '09	0.02
Coniagas, s.....	Ont.....	800,000	5	720,000	July '08	0.15
Consolidated M. & S.	B. C.....	53,552	100	781,885	Nov. '07	1.25
Crow's Nest Pass....	B. C.....	160,000	25	2,018,648	July '07	0.62½
Crown Reserve, s...	Ont.....	1,750,000	1	612,500	Mar. '09	0.15
Dolores, g. s.....	Mex.....	400,000	5	600,000	May '09	0.15
Dominion Coal, com.	N. S.....	150,000	100	3,150,000	Jan. '09	1.00
Dominion Coal, pf..	N. S.....	30,000	100	†630,000	Feb. '08	3.51
Dos Estrellas, g. s...	Mex.....	300,000	0.50	3,780,000	Jan. '09	1.00
El Oro, g. s.....	Mex.....	1 080,000	5	4,989,600	July '08	0.36
Esperanza, s. g.....	Mex.....	455,000	5	9,390,400	Mar. '08	0.37
Foster Cobalt, s....	Ont.....	1,000,000	1	50,000	Jan. '07	0.05
Granby CWn.....	B. C.....	135,000	100	3,508,630	Dec. '08	2.00
Greene Con. Copper.	Mex.....	864,000	10	6,137,800	Mar. '07	0.40
Guanajuato.....	Mex.....	540,000	5	74,250	Oct. '06	0.07
Guanajuato D., pf. s.	Mex.....	10,000	100	30,000	July '08	3.00
Guggenheim Expl...	Mex.....	105,000	100	5,272,500	April '09	2.50
Hinds Con., g. s. c. l.	Mex.....	5,000,000	1	100,000	Feb. '08	0.02
Kerr Lake, s.....	Ont.....	600,000	5	1,108,000	June '09	0.30
La Rose Con., s....	Ont.....	1,143,368	5	628,252	April '09	0.20
Le Roi, Ltd., g.....	B. C.....	200,000	25	425,000	Dec. '06	0.48
Le Roi No. 2, g.....	B. C.....	120,000	25	889,200	Mar. '09	0.48
Luck yTiger-Com., g.	Mex.....	65,000	10	71,500	Dec. '08	0.30
McKinley-Darragh, s	Ont.....	2,000,000	1	480,000	Jan. '09	0.05
Mex. Con. M.&S. Co.	Mex.....	240,000	10	660,000	Mar. '08	0.25
Mex. Mill.&Trans.pf.	Mex.....	12,000	100	35,450	Jan. '08	3.00
Mines Co. of Am....	Mex.....	2,000,000	1	3,545,000	April '09	0.02
N. Y. & Hond. Ros..	C. A.....	150,000	10	2,467,000	Jan. '09	0.10
Nipissing, s.....	Ont.....	1,200,000	5	2,640,000	April '09	0.25
N. S. St.&Coal, com.	N. S.....	9,876	100	1,087,856	April '08	1.50
N. S. St. & Coal, pf..	N. S.....	10,300	100	479,130	April '09	2.00
Penoles*.....	Mex.....	2.500	100	8,630,000	Dec. '07	20.00
Peregrina, pf. s.....	Mex.....	10,000	100	538,656	Mar. '09	3.50
Pinguico, pf. s.....	Mex.....	20,000	100	240,000	Oct. '08	3.00
Reco, g. s. l.....	B. C.....	985,000	1	527,082	April '06	0.02
Right of Way.....	Ont.....	499,518	1.00	189,822	May '09	0.10
Securities Corp., pf..	Mex.....	2,000	100	42,699	July '08	3.50
Silver Queen, s.....	Ont.....	1,500,000	1	345,000	Nov. '08	0.05
Temiskaming, s....	Ont.....	2,500,000	1	525,000	April '09	0.06
Tezuitlan Copper...	Mex.....	10,000	100	.....	Dec. '08	1.20
Tilt Cove, c.....	N. F.....	89,000	2	495,630	May '08	0.55
Tretheway, s.....	Ont.....	945,450	1	311,998	May '09	0.10
Tyee, c.....	B. C.....	180,000	5	201,600	Aug. '07	0.03

*Mexican Currency. †Since reorganization. ‡Since August, 1905.

Industrials

John W. Freeman has been appointed manager of the Sprague Electric Company's Pittsburg office to succeed F. W. Barry, who recently resigned.

Traylor Engineering Company, Allentown, Penn., advises having closed a contract with the Leesburg Mining Company, of Columbus, Neb., for a 30-stamp mill.

Smooth-On Manufacturing Company, Jersey City, N. J., has issued the third edition of its Smooth-On instruction book No. 7 and will send a copy to any engineer on application.

The Wood Drill Works, of Paterson, N. J., has put in a stock of drills at Toronto, Ontario, Canada, at the showrooms of the A. R. Williams Machinery Company, which has branch offices in Winnipeg, Vancouver and Montreal.

The Carnegie Steel Company has added to the 1550-h.p. in Crocker-Wheeler form W motors in its Duquesne plant by the purchase of three more motors of the same type, especially designed for rolling-mill work, aggregating 225 h.p.

Tate, Jones & Co., Inc., Pittsburg, Penn., has just received an order through the Erie City Iron Works from the Union Pacific Railway, at Omaha, Neb., for a complete oil-burning equipment for use in connection with the Erie City "Economic" boilers.

The San Francisco branch office and warerooms of the Sullivan Machinery Company are now located at 461 Market street, in the Sheldon building, instead of at 26 Fremont street, as heretofore. Sullivan air compressors, diamond drills, rock drills and other mining machinery are carried in stock.

S. Morgan Smith Company, York, Penn., has opened an office at 644 American Trust building, Chicago. J. C. Temple, a well-known hydraulic engineer, who has been engaged in the water-wheel business for many years, has charge of this office and will be pleased to hear from people west of Pittsburg who are contemplating installing turbine wheels.

S. B. Stine, Osceola Mills, Penn., has recently purchased the Osceola Foundry and Machine Company, formerly known as the J. J. Pie' Estate, which has been in operation for some thirty or forty years. Interested parties will be pleased to learn that this plant is again in operation and that they can secure duplicate parts of the various machines which have been installed during this long period.

The Wood Drill Works, of Paterson, N. J., is distributing through the home office and United States representatives, Booklet H-29, entitled, "A Word With Thee," explaining the drilling methods used in constructing the South Scranton tunnel, the great dam of the Hollingsworth & Whitney Company, at Madison, Maine, and cuts of some of the undertakings in which the "Wood" rock drill figured prominently.

Alberger Condenser Company 95 Liberty street, New York City, has issued catalog No. 13 pertaining in particular to Wainwright water heaters. This covers the hot-water service heater as ordinarily used for domestic supply and swimming pools, also covers heaters for hot-water heating system. The catalog will be found to be very interesting and contain information of value, and copies will be furnished upon application.

Frank Wells Hall has been appointed manager of the Philadelphia office of the Sprague Electric Company. Mr. Hall was formerly connected with the Sprague Electric Company, both in the New York and Chicago offices in engineering and sales capacities. His knowledge of the Sprague Electric products combined with his wide circle of acquaintances and his extensive business and engineering experience will undoubtedly win for him a large clientele in his new territory. Mr. Hall assumed his new duties April 15, 1909.

The Shannon Engineering and Contracting Company are consulting engineers, devoted to modern appliances for handling all kinds of material. The company has been recently organized to engage in the manufacturing of complete industrial railways, cars of every description, cable and automatic railways, and also deal with steam and electric locomotives, hoisting engines and other contractor's equipments. The organizers of this company are H. E. Mills and O. W. Scholz, having had over twenty years' experience in this particular class of work.

Fred M. Prescott Steam Pump Company, in order to facilitate the increasing demand for its product, has opened up another district sales office, at Atlanta, Ga. All business accruing in the southern and southeastern States will be handled directly from there. All inquirers will find the new office equipped with full engineering data, prices and information affecting any pumping machinery problem. The office is in charge of R. L. Radcliffe, who has been connected with the company's sales department for some time.

What might be called a pocket edition general catalog has just been gotten out by the Joseph Dixon Crucible Company, of Jersey City, N. J. This lists its principal products, such as crucibles, facings, lubricating graphite, greases, pencils, protective paint, etc., giving brief descriptions and prices. It is of value to the purchasing agent, engineer, contractor, superintendent, and anyone, in fact, who uses or specifies graphite in any form. The booklet is of commercial envelop size, and will conveniently go in the pocket or desk pigeonhole. It is substantially bound in tough cover stock, and attractively printed. A copy can be secured by writing direct to the company.

Elaterite roofing is not paper roofing, it is solid, reinforced, weather-resisting cement. It has been made for over ten years with a reinforced body of cement (the same principle is now being employed by modern builders, using reinforced concrete) this makes a strong and durable roofing. Elaterite roofing consists of a solid body of tough, pliable, non-drying elaterite cement, which retains its properties throughout the long life of the roofing. The body of cement is reinforced with a heavy fabric center and saturated wool-felt back. The regular grades are finished with a top layer of Mica and are as follows: 5X grade is reinforced with one layer of imported india burlap and weighs about 65 lb. per square. 4X grade is reinforced with one layer of imported india burlap and weighs about 55 lb. per square. 3X grade is reinforced with heavy muslin and weighs about 40 lb. per square. The Western Elaterite Roofing Company, Denver, Colo., will send full particulars on application.

Eimer & Amend have issued a new catalog entitled, "Calorimeters and Pyrometers." Under "Gas Calorimetry," full data of the Junker calorimeters for gas and liquid-fuel testing is given, these being the standard instruments of their kind in general use. Under "Solid Fuel Calorimetry," which has become such an important subject, due to the general movement toward buying coal strictly on its true heating value is given a short treatise on the sampling of coal (which is a most important element in the process of the determination of the heating value of fuel), also a working description of the Emerson fuel calorimeter. This instrument, which embraces all the latest features in calorimetry, is meeting with much favor, on account of its ease of operation, extreme accuracy and low cost. A brief description of the standard Mahler and Atwater bombs is also given. Under "Pyrometry," special attention is directed to the Wanner optical pyrometers, which are the most accurately reading instruments for temperatures up to 7000 degrees. Also Fery radiation pyrometer and the new telephone resistance pyrometer, the latter instrument being low in price, simple of operation and very accurate.

The D'Olier Engineering Company has secured contract from the United States Government for a complete hydroelectric plant at Fort Yellowstone, Yellowstone National Park, including penstock and concrete power house. This installation will be used for furnishing light and power throughout Yellowstone Park and will consist of three 150-kw. alternating-current, 3-phase, 60-cycle generators, each direct connected to one 280-h.p. D'Olier Francis turbine water wheel operating under a head of, approximately, 275 ft. The water will be carried to the power house by a 26-in. steel penstock, which will be installed by the company and which will be provided with automatic-relief valves and large air chamber to aid in the regulation of the turbines, as the matter of regulation presents some difficulties, owing to the length of the penstock, which is, approximately, 2200 ft. A complete switchboard of the most modern type and transmission wiring are included in the contract. The turbines will be of the single-discharge type, with 22-in. runners mounted in cast-iron spiral flume on a horizontal shaft and discharging into the cast-iron quarter-turn fittings resting on cast-iron base plate. The wheels will be of government bronze and the swivel gates will be of manganese bronze of the D'Olier Engineering Company's latest swinging type. A flywheel is provided on each wheel with an effective flywheel effect of 6000 lb. The entire installation is of the most modern type, and it is expected that high efficiency and low maintenance expense will be secured.

Trade Catalogs

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1436. Trommels or revolving screens. Illustrated, 24 pages, 8x10½ inches.

Wilbraham-Green Blower Company, Pottstown, Penn. Bulletin No. 4. Rotary positive pressure blower. Illustrated, 4 pages, 6x9 inches.

C. W. Hunt Company, West New Brighton, N. Y. Catalog No. 091. Coal and ore handling machinery. Illustrated, 86 pages, 6½x9 inches, paper.

Grönkvist Drill Chuck Company, 18 Morris street, Jersey City, N. J. Catalog. Johansson combination standard gages. Illustrated, 28 pages, 9x11 inches, paper.

B. F. Sturtevant Company, Hyde Park, Mass. Bulletin No. 105. Gas boosters. Illustrated, 3½x6 inches. Bulletin No. 106. Electric ventilating sets. Illustrated, 3½x6 inches.

Brown & Sharpe Mfg. Co., Providence, R. I. Catalog. Milling machines, grinding machines, automatic gear cutting machines, screw machines, cutters, machinists' tools, etc. Illustrated, 552 pages, 3½x 6 inches, paper.

The Browning Engineering Company, Mansfield, Ohio. Bulletin No. 33. Revolving steam shovels. Bulletin No. 34. Automatic buckets. Bulletin No. 35. Locomotive cranes. Bulletin No. 36. Railroad ditcher. Bulletin No. 37. Scraper bucket excavators. Illustrated, 6x9 inches.

The Morigrieve Engineering Company, 44 Market street, Perth Amboy, N. J. Bulletin No. 1. Grieve safety device for jet condensers. Illustrated, 4 pages, 5½x8½ inches. Bulletin No. 2. A. M. C. elastic metallic packing. Illustrated, 4 pages, 5½x8½ inches. Circular. Angell steam trap. Illustrated.